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(see pages 26 and 54)

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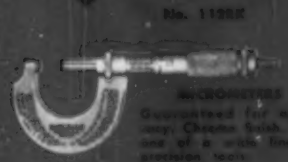

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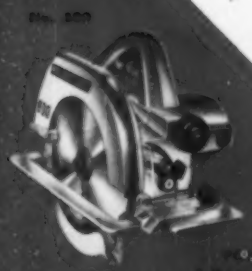

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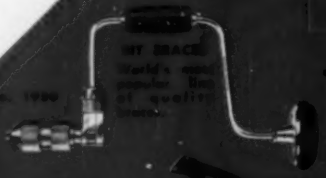

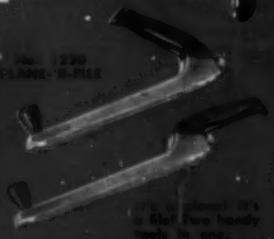

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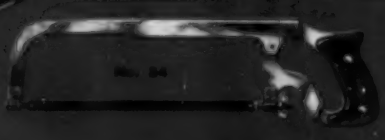

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your IA/VE for March

The 1961 edition of your March school shop annual inaugurates a new section on managing the school shop.

In addition to the traditional articles on planning the school shop, material on how to utilize these facilities is included here to complement the planning stage. Certainly, good planning is only half the process; there must be an efficient use of these facilities by the shop teacher. This section on shop management attempts to provide guides for the best possible use of the well-planned shops.

Articles in your March IA/VE in the two sections which we believe you'll find interesting include:

1. Planning the Shop. Since the Conant report, there has been stress on the "comprehensive" high school which has larger groups of students in urban or suburban areas. Two examples of facilities planned to serve both exploratory industrial arts students and terminal vocational students in basic I-E subjects are presented (pg. 42) as guides to the latest approaches. For schools planning expansions of I-E programs, there are two presentations (pg. 34) of special buildings to house growing student enrollments and courses in industrial arts and T & I. On the college level, there is a review of the new facilities at San Jose (pg. 26); in the special education area, there is a discussion (pg 38) of the highly specialized Aviation High School at New York.

2. Managing the Shop. A seven-part program (pg. 54) for reducing time spent in "paper work" should contribute substantially to the freeing of the teacher's time for instruction with the resulting improvement in the teaching-learning process. For better management of equipment — selecting, installing, maintaining, etc. — our discussion (pg. 57) has guides for upgraded procedures. In the area of supplies there is a general outline (pg. 59) of how to select and manage them, as well as a detailed program (pg. 61) for handling them to make them available to students when needed.

There are several other articles in both sections which we hope you'll have a chance to read through — and to review when you plan new laboratories.

In addition to the regular departments, please don't forget that your March school shop annual has lists of equipment and supplies (pg. 76) and a list of manufacturers of material (pg. 119) for your shop program.

for April . . .

April is AIAA convention time and your April IA/VE will preview this year's meeting in St. Louis with a detailed listing of exciting topics and speakers. Whether or not you can get away for the convention, we believe you'll benefit from looking at our preview of what's been planned.

the editors

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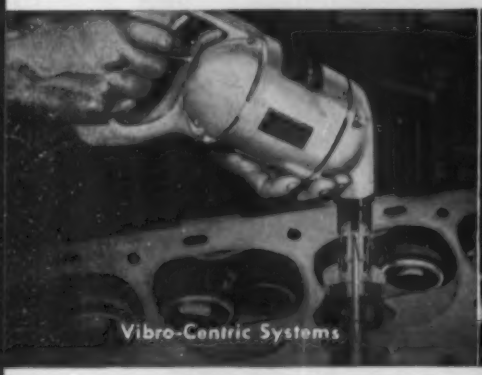

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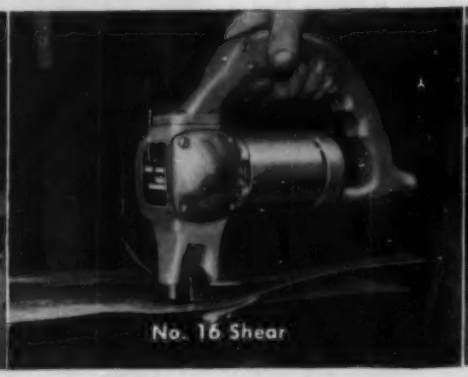

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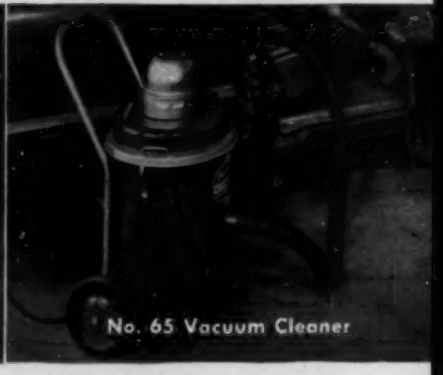

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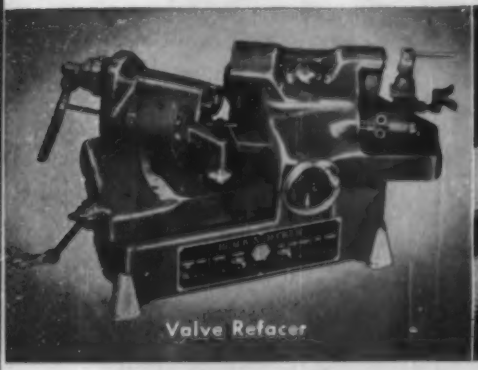

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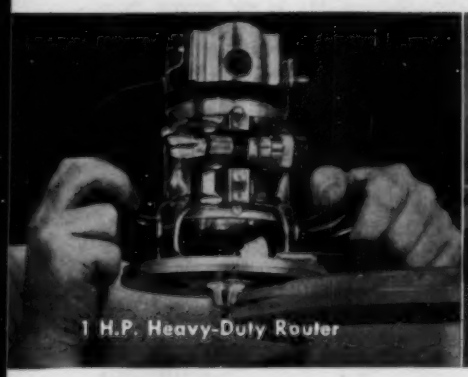

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letters

for more skills

It is about time that the point of view, as expressed by Mr. Robert A. Henry, in the December issue of IA/VE (see pg. 13), was aired.

It is unfortunate that the trend in industrial arts has been to take the "work" out of shopwork. If all the material we are expected to teach is so important, why not set up a separate course of study? I do not believe that the community would tolerate such a course.

I, for one, feel that there should be more "shop" in our shop courses.

David P. Elias, Theodore Roosevelt High School, New York City Schools

It is with mixed feelings that I make the following comments about Mr. Gardner's article, "Beware the Project" (see pg. 54 of your IA/VE for October). I hesitate to criticize a fellow New Yorker in a different college — all part of our New York State University system — but I couldn't resist. In my opinion there is nothing that will destroy an industrial education program faster than the advice given here.

The United States and the whole World . . . is short of skilled workers and technicians. Particularly, our smaller schools have for the most part failed to include a program which prepares pupils for entrance into the skilled trades. A few states do have area vocational schools and the National Defense Education Act is trying to encourage more activity of this sort. While I appreciate that a line of demarcation is *supposed* to exist between industrial arts and industrial vocational education, the line is most fuzzy and few lay people — including school board members — are aware of it. To them it is all *shop training!*

I appreciate the writer's desire to include this related or general education into the industrial arts program — but much of it mentioned in the article is relatively quite unimportant to the high school pupils who *should* be taking these courses.

Point 1. Pupils preparing for college entrance do not have time for industrial type courses — with the possible exception of the very full technical curriculum. Industrial arts, therefore, should not be designed for the future professional or administrative worker.

Point 2. The basic value (Conant) of industrial programs is to provide something of interest (shop skills including construction or repairing) to thereby hold the under-achieving boy in school so that he can take more English, Math, History, etc., to make him a better citizen. The proposal of this article would remove this basic interest.

Point 3. The basic skills and know-how which would be taught in a different type of industrial course (let's forget the terms vocational and non-vocational) will both provide some "saleable skills" plus the incentive to perhaps go on to a trade or technical (post secondary) school.

E. W. Foss, professor, department of agricultural engineering, New York State College of Agriculture, Cornell University, Ithaca

on the demonstration

In the article, "How to Give a Demonstration" (see pg. 36 of your IA/VE for September, 1960), it is mentioned that "all of the necessary visual aids are to be displayed before starting."

As one dealing with the subject of teaching techniques, I find it difficult to understand the statement.

It is my considered opinion that no visual aid intended to be used in a lesson for instructional purposes, should be displayed before it is actually needed at a predetermined stage of the lesson. What is more, it is even suggested that the aids should be kept out of sight of the learner till a need is created for it in the learner. It is then that it has its full use.

If the aids are displayed beforehand, it is likely to distract the attention of the learner, a situation every instructor should try to avoid.

E. G. Menon, senior master, Central Training Institute, Aundh Camp, Poona, India.

on interpreting industry

I was very much interested in your editorial (see pg. 11) in the January issue of IA/VE. I am inclined to believe that the well-established objectives of industrial arts teaching will, in part at least, be neglected if the teacher of industrial arts is expected to do very much in interpreting industry to his students.

W. N. Fenninger, executive secretary, ATEA

This is a hurried note to offer congratulations for a very fine editorial in the January issue of IA/VE. The questions you have raised are sound and have needed to be asked. I hope you will continue to be forthright in similar fashion as you look at other aspects of the program.

William J. Micheels, professor and chairman, department of industrial education, University of Minnesota

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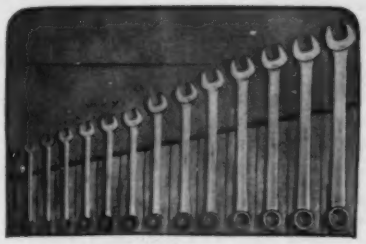

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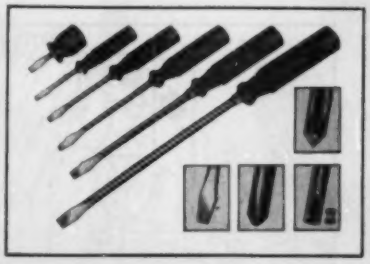

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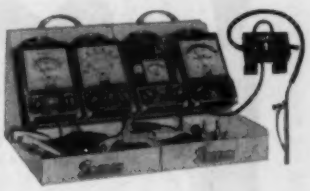

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news

new AIAA secretary Kenneth E. Dawson, West Hyattsville, Md., has been appointed the first full-time executive secretary of the American Industrial Arts Association with an office in the NEA building in Washington, D. C.

Mr. Dawson received his BS degree from Virginia Polytechnic Institute, his Med. degree from the University of Virginia, and has completed all of the course work for a doctorate at the University of Maryland. He has taught in the public schools of Virginia, served on the staff at Virginia Polytechnic Institute, and was graduate assistant in industrial arts at the University of Maryland. He has been teaching in the Montgomery County, Md., schools recently. He is 33 years old, married, and the father of a 1-year-old daughter.

Dr. Kenneth W. Brown, who has served as part-time executive secretary-treasurer of AIAA for the past nine years, will work closely with Mr. Dawson. Dr. Brown will retain his position as treasurer.

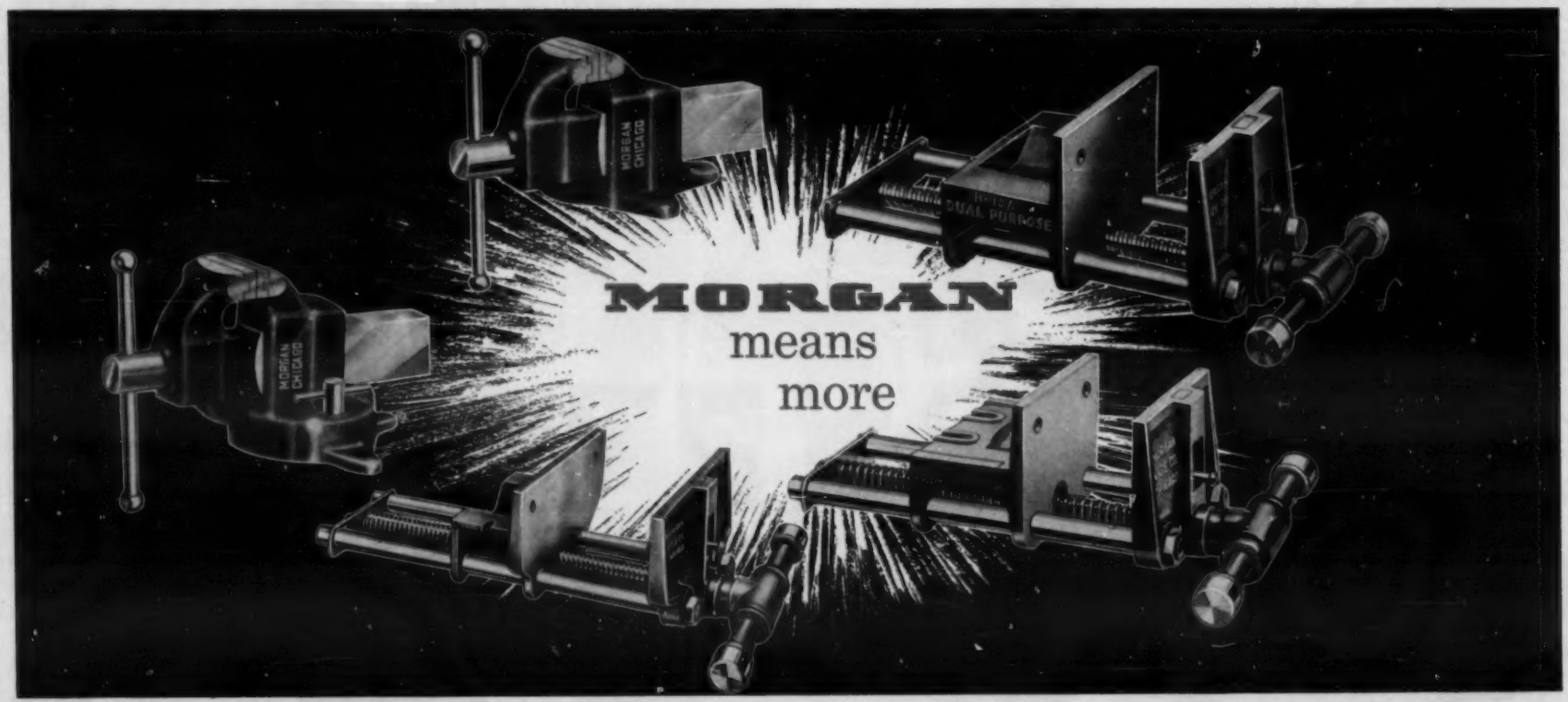
voc-ed future Programs of vocational education to provide more effectively and more adequately for the nation's needs in the years ahead are proposed in a recently released office of education report, "Vocational Education in the Next Decade." In discussing "how vocational education should be made available to every person who wishes it," the report proposed: (1) a continuation, expansion, and some redirection of present programs in vocational agriculture, distribution, homemaking, and trades and industry; (2) an expansion of the area programs for technicians authorized under Title VIII of NDEA; (3) new programs for such special groups as the unemployed, underemployed, dropouts, migrant farm workers, the aging and handicapped, etc.; (4) an increase in federal state, and local expenditures for vocational education programs from $267 million in 1961 to $570 million annually by 1970.

NYU spring conference Contemporary Industrial Arts Methods will be the subject of a one-day Spring Conference sponsored by the Department of Vocational Education, New York University, Saturday, March 18. Dr. Donald Maley, head of industrial education, University of Maryland, will be the principal speaker. Panel discussions will be led by the following experts in modern approaches to teaching industrial arts on the following subjects: "Keeping Pace With Industry Through the Use of the Traditional Project" — Roy Orendorf, supervisor, Bureau of Industrial Arts,

(Continued on page 14)

"To be a doctor, he sure has a weird way of treating a hangnail."

(For more information from advertisers, use the postcard on page 121)



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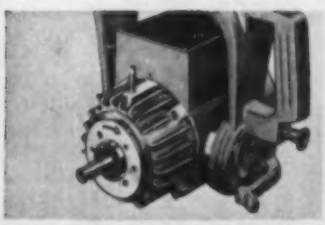

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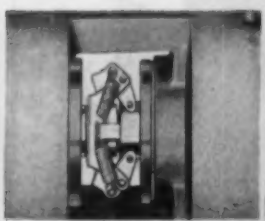

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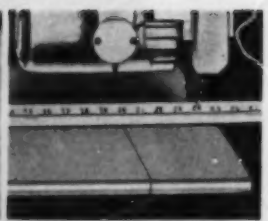

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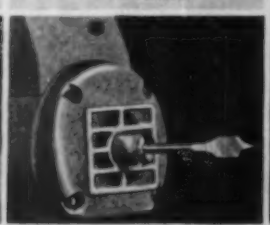

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NOW...more than ever...you'll make DeWalt your No. 1 choice for industrial arts and vocational training. This new 1030 DeWalt brings still greater safety, versatility and accuracy plus other extras.

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- 10" saw, radial type, model 1030 DeWalt.
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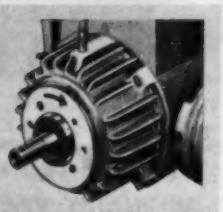

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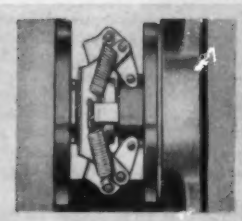

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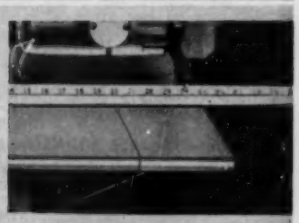

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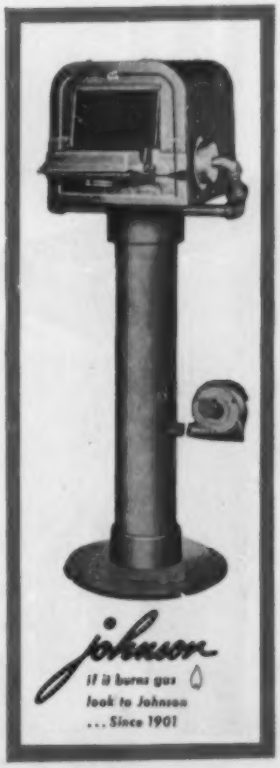

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NEWS

(Continued from page 10)

State Education Department, Albany, N. Y.; "Interpreting Industry Through the Mass-Produced Project" — Dr. George Keane, assistant professor, Division of Industrial Arts, City College of New York, New York City; "Relating Science Experiments to Industrial Arts" — Abraham Beleson, Bronx High School of Science, Bronx, N. Y.; "Experiments With Materials and Products of Industry" — Dr. Arthur Earl, professor of industrial arts, Montclair State Teachers College, Montclair, N. J.

curriculum strengthened The demand for I-A teachers with more preparation with depth, which is increasing in Wisconsin as well as other states, has led to a strengthening of curriculum in industrial arts at Wisconsin State College and Institute of Technology at Platteville.

Accordingly, a comprehensive major has been introduced that requires approximately 68 semester hours with added stress in any two of the areas of (1) metal fabrication, (2) graphic arts, (3) wood technology and practice, (4) electricity and electronics, (5) drafting and design for the building industries, and (6) technical drafting.

Students who do not care to teach must take from 14 to 18 credits in any three of these six areas which should make graduates of this option attractive to industry.

PROMISING PRACTICES IN INDUSTRIAL ARTS

1. Industrial arts should become an even more important curriculum area in the elementary and junior high schools.
2. An industrial arts library and planning center should be provided in each shop or laboratory.
3. A strong program in senior high school industrial arts should be provided for those students who are college bound; especially if they are planning on careers in such areas as engineering, science, and dentistry.
4. Some time should be devoted to organizing most industrial arts classes for a unit on massproduction.
5. A pupil personnel plan should be set up in all industrial arts classes to bring the pupils in on the actual management and operation of the program.
6. Project exhibits with evaluation by impartial judges should be held annually.

— **Howard Reed and Guy Wagner in the Midland Schools**

The mathematics, physics, or chemistry, history, English, and other academic requirements have been retained.

Student interest is high in the comprehensive major and graduates should experience no difficulty in finding choice positions in industry or teaching, according to H. A. Pederson, chairman of the school's department of industrial arts.

I-E exhibits Five regional industrial education exhibits will be held throughout

(Continued on page 18)

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with canvas or steel band

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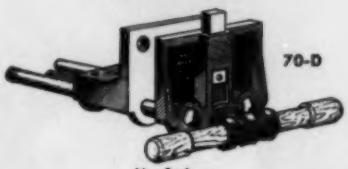

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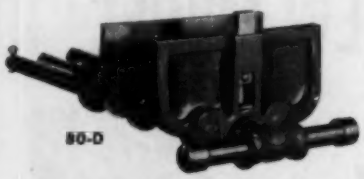

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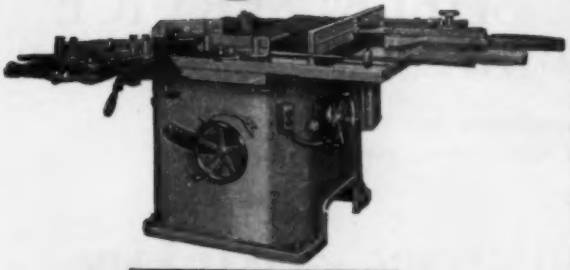
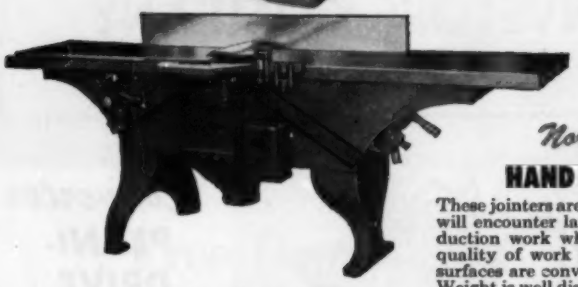


The Northfield NO. 4 VARIETY SAW

Tilting Arbor Type

The NORTHFIELD No. 4 Variety Saw is a carefully designed, quality machine with the latest features. It offers maximum versatility for all around sawing in any school shop. In addition to wood it's adaptable for cutting light metals, plastics, and other materials. The table on the basic machine is 44" x 36", plus a 19½" extension for carrying the rip gauge table. One or more 12" table extensions can be furnished to increase table size. A rolling section table is also available. You'll like this machine for its versatility, heavy duty capacity, ease of handling, and speed with precision.



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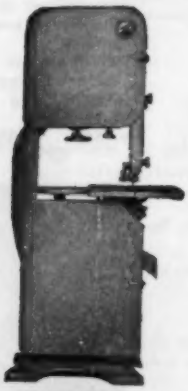

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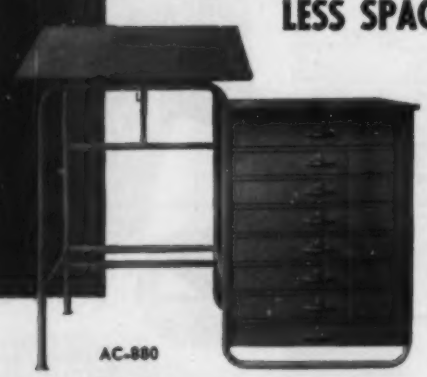

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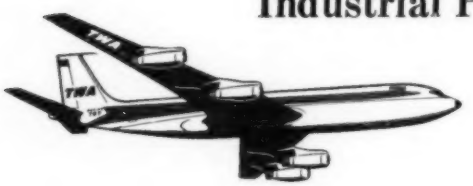

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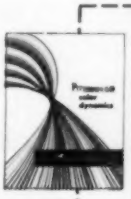

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Junior and senior high industrial arts students in South Bend are kept abreast of latest industry developments and ideas through a monthly program instituted by Floyd M. Dickey, supervisor of industrial arts for school city, seated far right above. Each month, thirty to thirty-five industrial arts teachers from four senior and thirteen junior high schools hear representatives from area industry tell about new developments.

Left to right, G. J. Dumont and H. W. Goetz, sales and laboratory personnel from the O'Brien Corporation, South Bend paint manufacturer, demonstrate the latest methods in wood finishing. Dickey has scheduled a wide variety of industry spokesmen since the teaching group includes a cross section of industrial arts.

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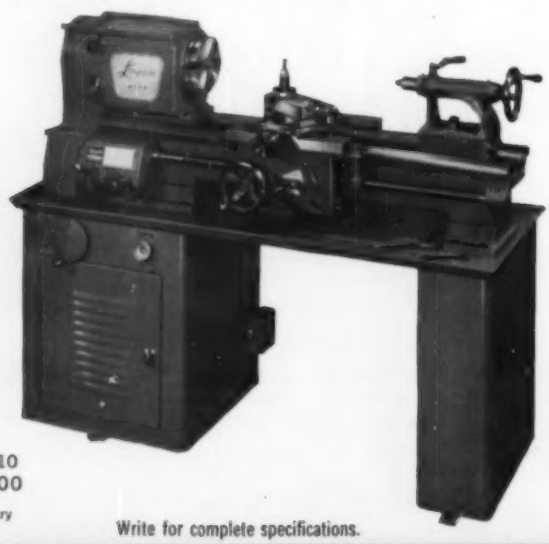

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Logan
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NEWS

(Continued from page 14)

the State of Illinois this spring. The award winners from the five regional exhibits are then eligible to participate in the statewide industrial education exhibit.

The schedule for the Illinois regional industrial education exhibits is:

Eastern Illinois University, April 28 and 29; Illinois State Normal University, April 28 and 29; Southern Illinois University, April 28 and 29; Northern Illinois University, April 27 to 29; Western Illinois University, April 21 and 22.

The State Industrial Education Exhibit will be held at Illinois State Normal University on May 11, 12, and 13.

manual arts club's golden anniversary The 50th anniversary of the St. Paul Manual Arts Club was commemorated with a dinner party at the Ryan Hotel, Saturday, February 11. The hotel was the site of the club's first organizational meeting in February of 1911.

(Concluded on page 22)

Surveying the School Scene

▸ Dr. Sterling M. McMurrin, vice-president of the University of Utah, Salt Lake City, has been appointed United States Commissioner of Education, succeeding Lawrence G. Derthick. The new commissioner has served as professor of philosophy and six years as dean of the college of letters and science at Utah.

▸ The executive committee of the Governor's Conference recently approved a proposal by Gov. Michael V. Desalle of Ohio to let the states have part of the Federal Income taxes collected in the states for school purposes.

▸ The number of pupils in secondary schools — grades seven through twelve — reached an all-time high in the school year 1958–59, according to a report recently issued by the Office of Education: 11,044,119 in 24,187 schools. There were 485,569 secondary school teachers.

▸ On January 30, the Midwest Program on Airborne Television Instruction at Lafayette, Ind., began its demonstration period of telecasts in which 14 series of telecasts will be transmitted from an equipped airplane on a regular weekly schedule to school districts in the surrounding midwestern states.

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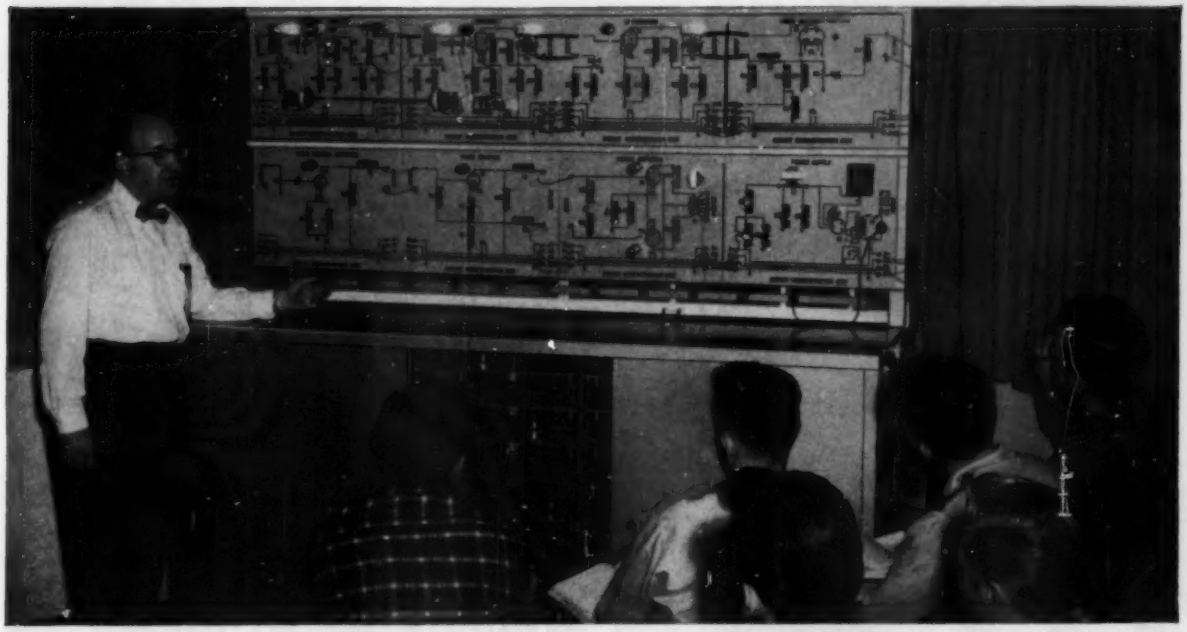
Now, complete in one package, you can get everything you need (equipment, texts and materials) to conduct one, two or three year courses in electronics. Your training program is tailored to the training objectives you specify in any area of the technology. And the complete package qualifies for purchase under the "National Defense Education Act of 1958".



Bucks County Area Technical School, Fairless Hills, Pa., George H. Schaffer, Principal

Lecture demonstration unit presents electronic theories and equipment with unique "building block" method

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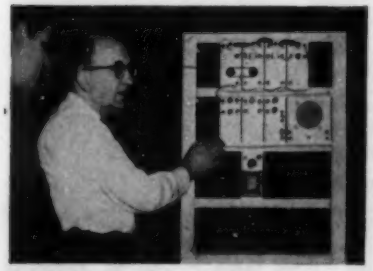
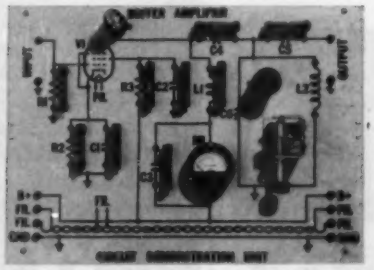
Students learn by doing with lab chassis that correspond to each "building block" circuit panel. Lecture demonstrations, lab experiments and tests are organized for the teacher in the instructor's manual. Students' work books provide direction and guidance. And everything is correlated with the textbook.

The Demonstration Unit houses as many as 40 different "building block" panels in its cabinet base. Entire unit moves easily on its own casters and plugs into any regular AC outlet. No building modifications needed.



Building Block Circuit Panel—Each is a basic circuit . . . function and relationship to entire system are easily explained as it is added on the demonstration unit.



Corresponding Lab Units—For each "building block" panel, there is a matching lab chassis, a complete and operating counterpart unit for laboratory experimentation.

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Big 34" x 6" table; sealed-for-life ball bearings; depth of cut ⅛". 6" Jointer Planer less motor, $99.95. 4" Jointer Planer less motor, $59.95.

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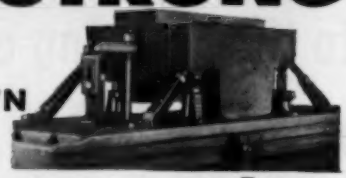

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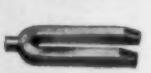

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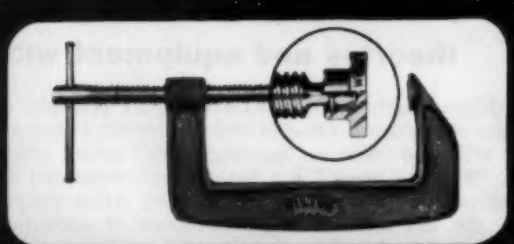

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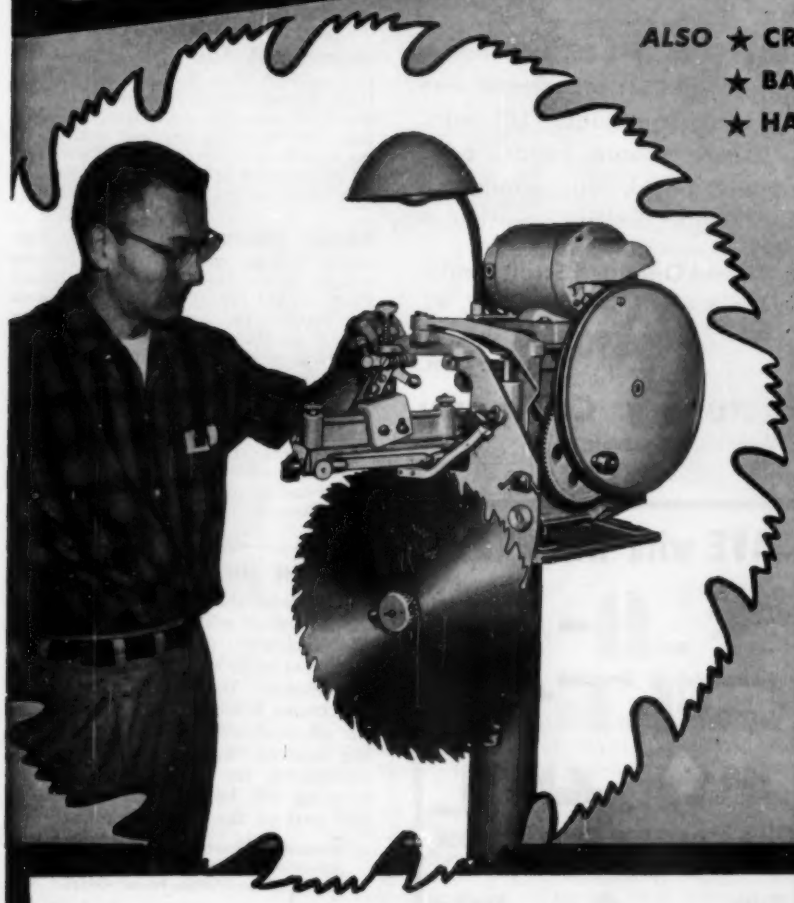

It's the new Model 200

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THE NEW model 200 Foley Automatic Saw Filer is the *first* and *only* machine which will file the so-called "combination" (rip and crosscut) circular saws; also crosscut circular saws, band saws, all types of hand saws.

The Foley Saw Filer is doubly valuable in manual training departments—it keeps all your saws in perfect cutting condition at low cost and greatly prolongs their life; it also is a great asset for training students in the correct care and maintenance of both hand and power saws. With the Foley Saw Filer, the Foley Retoother (for hand saws) and Foley Power Setter, (last two not shown) you can sharpen *4 to 6 hand saws per hour.*

The exclusive Foley principle of jointing the saw as it is filed, keeps all teeth uniform in size, shape and spacing; it also keeps circular saws perfectly round. This assures a fast, smooth, true cutting saw that stays sharp longer, runs cooler, and frequently doubles the life of the saw.

30-DAY TRIAL OFFER

You may try the new Model 200 Foley Saw Filer in your own shop for 30 days. See for yourself its precision work, advanced design and quality construction—time-proved through more than 50 years manufacture and use of previous models. Write for literature and details of 30-day trial offer.

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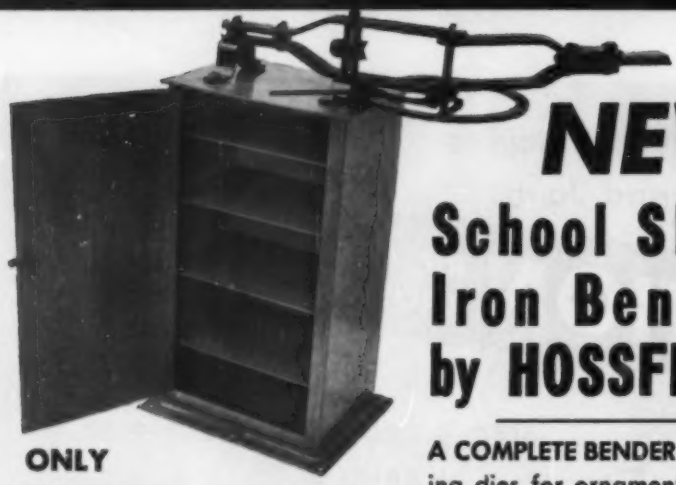

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Your students will learn simple and compound angle set ups for any machine tool used in tool room or on production • Double swivel cradles (each allowing 90° adjustment), over a full swiveling base (allowing 360° rotation) for three separate motions — individually adjustable and lockable • Fully graduated.

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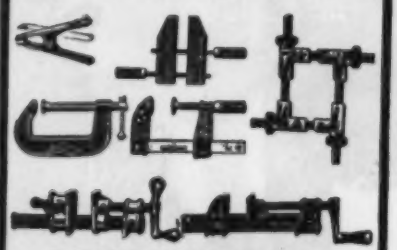

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NEWS

(Concluded from page 18)

According to Reinhard Sitzer, general chairman for the event and mechanical drawing instructor at Mechanic Arts High School, the club is believed to be the oldest of its kind in the nation. Its purpose, he explains, is to promote practical arts education, to upgrade teaching and to foster fellowship among members of the public schools' industrial arts and vocational staff.

Highlights of the evening included an address by Dean Schweickhard, Minnesota State Commissioner of Education; presentation of 25-year membership awards; and ceremonies honoring charter members.

second I-A fair The Industrial Arts Club of Fort Hays Kansas State College, Hays, Kansas, will hold its Second Annual Industrial Arts Fair April 28th and 29th, 1961. The first fair was well received by the schools of Western Kansas. There were 42 participating schools and 610 projects were displayed.

Kodak photo awards High school students can enter their favorite pictures in the 1961 Kodak High School Photo Awards up to midnight of March 31. Topping the list of prizes totaling $11,750 are those of $400 and $300 in the black-and-white division, and $350 in the Color Section.

The awards are open to students in grades 9 through 12 who are in daily attendance at any high school in the United States or its territorial possessions. Students are urged to mail their entries soon. Address entries and inquiries to Kodak High School Photo Awards, Rochester 4, N. Y.

ON THE SHOP OF THE FUTURE

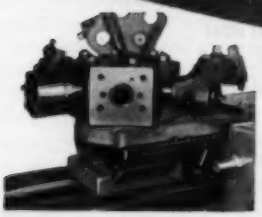
The industrial education laboratory of the future will consist of a group of efficiently organized individual technical areas which can function as autonomous, or as integrated units. Maximum flexibility will characterize the physical setting, as well as teaching content. Adequate facilities and equipment for testing and experimenting will be included as an integral part of the shop program.

— **Bernard S. Proctor, Director, division of industrial and technical education, Central State College, Wilberforce, Ohio.**

national welding competition

All high school students will be eligible for the first time to compete in a $15,000 national welding competition sponsored by the James F. Lincoln Arc Welding Foundation. Formerly, only vocational agriculture students were eligible. Cash awards will be offered totaling $7,500 in each of two divisions: agricultural education and industrial education. The latter division is split into two sections, one for industrial arts and the other for vocational trade and industry. Each section gives 61 awards that total $3,750. Prizes will be given to full-time high school students who prepare and send to the Foundation the best descriptions of how arc welding was used on a school-supervised project for maintenance, repair, or construction. Projects may be made either by individual students or by groups of two or three. For details, write the Foundation at Cleveland 17, Ohio.

See the new SHELDON 3R TURRET LATHE



for:
8-Station Production Machining
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Chucking
Single Point Threading.

Cost..... **$7,167.00**
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6 STATION HEX TURRET
Ruggedly built, accurately machined, mounted on precision tapered roller bearings. Drilled and tapped for standard flange tooling and bored for standard ½" shank type tooling.

POWER FEED BOX
Fully enclosed power feed box runs in oil, has quick acting controls for selection of feed direction and feed rate.

UNIVERSAL CARRIAGE
Incorporates both power longitudinal and power cross feeds through apron clutches. Has heavy duty cross-slide with both front and rear tool blocks.

PUSH BUTTON CONTROLS
Turret power feeds are engaged by pushbutton controls on the headstock. Other pushbuttons control operation of 2-speed, 5 h.p. motor.

No turret lathe is better suited for advanced classes, trade schools and industrial trainee programs than the new Sheldon 3R Turret Lathe, for this lathe permits demonstration and practice of modern production machining with modern tooling and control features.

Powered by a 5 h.p., two-speed, geared motor, this new turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide and 180 different feeds to the ram turret. The turret itself is ruggedly built and accurately machined to provide close tolerance indexing.

This new Turret Lathe is safe and easy to operate because all controls are centrally grouped. Even the ram turret is put under power by a control panel bush button.

Precision Machine Tools in the Size You Need Most
Sheldon builds an extensive line of 10", 11", 13", 15" lathes, milling machines and shapers for tool rooms, instrument shops, maintenance shops, schools and production plants. Each machine is a modern precision tool, and the individual test sheet and sample test cut shipped with it, proves its individual accuracy. All are moderate in price.

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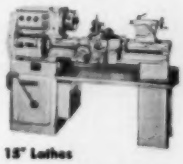
Bench Lathes

Cabinet Lathes

Pedestal Lathes

Push Button Variable Speed Lathes


15" Lathes

Milling Machines

Shapers

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Builders of 10", 11", 13", 15" Sheldon lathes, Sheldon Milling Machines, Sheldon Shapers and Sebastian Geared Head Lathes

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ANNOUNCING

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Designed to Meet Laboratory Program Requirements of EIA- New York Trade School Course "Industrial Electronics"

This new course was prepared in response to requests from educators. It sets a standard in a field previously undefined, and provides 30 experiments representing fundamental building blocks in industrial electronics technology.

ErecTronic Kit BE-7 provides all parts and components for breadboard experiments covering basic circuits in:

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Write for complete details on ErecTronic Kit BE-7 and applicable Test Instruments.

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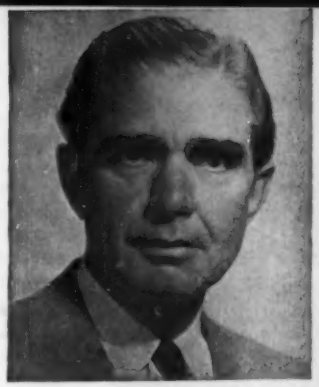
NEED FOR STANDARDIZATION OF MATERIALS PREPARED BY INDUSTRY



the editor's stand

Each year industry spends hundreds of thousands of dollars on the preparation and distribution of instructional and informational materials. Some of this is designed to advertise the product to the consumer public. Other materials are of a highly technical nature prepared for a limited readership of engineers, technicians, or servicemen. Much of the material, however, is intended for use in the school — and particularly in school shops. Educators appreciate this contribution and industries' efforts are tremendously commendable. However, for many reasons, some of which we will try to analyze, much of the material ends up in the wastepaper basket instead of in our instructional program. We feel this is a tragic waste.

Charts From Industry

Let's take a look at some of the present conditions that exist. One good example of wasted effort is to be found in the excellent charts published by industry. These include everything from standard reference charts, such as decimal-equivalent tables and tap-drill charts, to information charts on tool and equipment parts and "how-to-do" charts on operational procedures. The trouble is that there is no standardization. They come in all sizes, kinds, and descriptions. Some are very small and contain so much information that they must be read with a magnifying glass. Others are so huge and bulky that they cover half a wall. The charts are mailed to the teacher in a comparable range of multi-sized tubes and packages. They come flat, folded, or in sections. Some charts are long and thin, others short and wide; they are printed on everything from thin paper to heavy sheet metal.

Many teachers want to use these valuable charts, but what happens when the teacher gets them? (*Editor's Note:* We are assuming that our teachers are interested enough to send for these fine, free materials.) It is certainly difficult, if not impossible, to store these charts properly. Even more difficult is the job of using them correctly. Only reference charts require permanent mounting on shop walls. All others should be stored except when being used for instruction. With charts of so many different sizes, it's hard to store them in rolls and impossible to keep them flat. Consequently, one of several things usually happens:

1. The teacher puts them up on the wall and leaves them there until they are so dirty and dog-eared that they become a disgrace; of course, they have lost their educational impact on the student after the first few days.
2. The teacher tries to keep them in the shipping containers, making infrequent use of them or forgetting them completely.
3. The teacher folds them so they will fit into a file cabinet drawer. This usually ruins the charts for display purposes.

We would like to see all companies producing their charts in a standard size which would fit standard storage racks and standard display racks. Everyone would certainly benefit from this. The manufacturer would feel secure in the knowledge that these valuable materials were being used; the teacher would find a definite place for them in his curriculum.

Printed Materials

With regard to printed instructional materials, conditions are even more disorganized. These come in every conceivable size from tiny booklets 2 in. wide and 6 in. long to large sheets measuring 10 by 12 in. These odd-sized materials are impossible to file or store effectively. Wouldn't it be a great help if all printed materials were on standard 8½ by 11 in. sheets, with punched holes to fit into three-ring covers? This is the standard size for all AIA file materials.

However, the need for standardization is in more than size alone. There are also the subjects of purpose, type, and advertising. Some manufacturers spend a great deal of time and money preparing materials that don't fit anywhere in the school curriculum. It is obvious to teachers that this material is prepared by people with little understanding or knowledge of industrial education. In some cases, far too much emphasis is placed on a rather small or insignificant part of a course. No teacher, for example, can appreciate a complete instructional program including such things as several full-length films, film strips, and instructional booklets — all covering one simple tool such as a screwdriver.

Suggestions for Standardization

We believe that before each new instructional material is prepared by a company the following questions should be given serious consideration:

1. What is the best size for each type of material? We feel that the 8½ by 11 in. size should be used for printed materials; the 17 by 22 in. for reference charts; the 35 by 45 in. size for all other charts and graphs.
2. Does the instructional material match the course outline? Our state curriculum guides should be checked for what is being taught in each course.
3. Who will use this material? The style of writing, the reading level, and the amount included should depend on whether the material is intended for teacher or student use.
4. What about advertising? The need and desire of companies to advertise their products is basic and we will be greatly remiss in failing to recognize this. The question of *how it is done* in instructional material is important, however, not only to the teacher but, more directly, to industry itself. Overemphasis of product name or peculiarities will nullify instructional usefulness. Far too many otherwise good industrial movies are rendered useless through too-liberal use of slogans, brand names, and the like.
5. How about duplication? It is too bad that so much identical material is produced. There must be at least 50 sources for decimal-equivalent charts. On the other hand, there are many tools, machines, and processes for which no industry-prepared material is available.

We hope that consideration will be given to these suggestions. We are certain that if school and industry could co-operate in this matter, it would mean better advertising results for companies and better instructional materials for the schools. We hope that this message will be read both by people in industry and in education, and that we can establish a co-operative committee to study this problem. We are sure that a satisfactory solution would be beneficial to everyone.

John L. Feirer

planning the school shop

This 1961 edition of your March IA/VE school shop annual surveys recent, well-planned industrial education facilities on the college, secondary, and special education levels as a source of ideas for adaptation in the shops you will be planning during the coming year.

In the area of teacher education is the building for industrial arts at San Jose State College, San Jose, Calif. On the local district high school level are two plants planned and built to serve expanding programs: the Easton (Pa.) High School T & I building and the Wewoka (Okla.) industrial arts building.

In specialized facilities there is the New York City Aviation High School with comprehensive and modern facilities for aviation education.

In the field of the comprehensive high school are two approaches to facilities designed to provide experiences ranging from exploratory industrial arts to terminal vocational education in all the basic industrial education subjects for large, urban, multi-track secondary schools.

Also, there is a discussion of the shop layout for power mechanics courses, as well as a collection of ideas on how to achieve "built-in" or engineered safety in the planning stage of school shops.

Industrial Arts Facilities at San Jose State

LOUIE MELO

San Jose State* is the oldest public institution of higher education in California. Since the year of its founding, 1857, it has developed from a normal school into a state college providing instruction in the liberal arts and sciences, in professions and applied fields, and in teacher education for both undergraduate and graduate students through the master's degree. Under provisions of the new master plan for higher education, the college, in conjunction with the University of California, may also award the doctoral degree.

Instruction of students is considered to be the primary function of San Jose State College. To this end, all efforts of the carefully selected faculty of almost 1000 and all facilities and equipment, valued at more than $25,000,000, are dedicated. A secondary function of the college, authorized in 1958 under the master plan, is the conducting of research. Many members of the teaching faculty, often assisted by students, are actively engaged in research and related creative activities. Through a balanced curriculum of study and experience, students at San Jose State enjoy a rare opportunity to acquire a broad general education, to develop their capabilities for responsible citizenship, and to prepare themselves for specialized careers in more than 100 major fields.

Planning and Construction

The new industrial arts building, dedicated in 1960, replaced a building which served the department for over 35 years. The old building had become entirely inadequate years ago, and, as a result, the department used numerous temporary facilities on campus to conduct its activities.

General preliminary planning for the new structure, in terms of the existing and projected curriculum offerings, was started ten years ago. However, more serious and earnest planning did not start until 1955 when it became apparent that funding for a new facility was close at hand. At this time, a building committee of the industrial arts department, under the chairmanship of Angelo Centanni, worked with the executive dean's office in the preparation and co-ordination of the college request. During this period, existing and projected curriculum offerings in teacher, occupational, and general education were again reviewed and educational specifications setting forth the functional needs of the department in terms of office, instructional, and auxiliary space were prepared and submitted to the state departments of education and finance.

On the basis of the preliminary drawings prepared by the state division of architecture, the legislature funded $2,595,300 for the construction of the building and $535,000 for special equipment not included in the construction fund. The resulting 110,000 square feet structure was completed and occupied in January, 1960.

*Informational data was received from vice-president's and executive dean's offices as well as industrial arts faculty members. Photographs were taken under the supervision of Mr. J. Campbell, industrial arts faculty member.

Dr. Melo is an associate professor in the Industrial Arts Department at the San Jose State College, San Jose, Calif.

The San Jose State Industrial Arts Building has many unique features. It is spacious and bold in its conception, giving adequate working room to all activities. Each laboratory has its own planning center where class discussions are held, students briefed, activities planned, and examinations written in comfort. Adequate laboratory supporting facilities are also provided in each instructional area.

All laboratories in the building are serviced by a central supply room which handles and distributes incoming materials, stock items common to many laboratories, and prepares requisitions for needed supplies and materials. A staff of four technicians maintain and install instructional equipment and assist in the preparation of tool holders, teaching aids, etc. The central supply area also contains the tools and equipment necessary for efficient utilization of technician time.

Faculty offices are centralized with the departmental office suite in one wing of the building. This arrangement provides each instructor with a certain amount of privacy for study, lesson preparation, and student counseling. It also permits all faculty members to have offices near the departmental office, thereby providing efficient use of secretarial services.

All laboratories are constructed on 20 by 40 ft. modulars. Auxiliary rooms, storage rooms, and planning centers are installed between the different laboratories reducing noise transfer. Whenever possible, walls are non-load bearing for future changes to meet curriculum modifications. The modular pattern has resulted in a simple and orderly room pattern. All laboratories (except auto) are 40 ft. wide and either 40, 60, or 80 ft. long. Planning centers are 20 by 20 ft. Auxiliary rooms behind or in front of the planning centers are also 20 by 20 ft., completing a 20 by 40 ft. unit.

All drawing and design rooms are located on the north side of the building and take advantage of the favorable natural lighting conditions. Through careful planning, nearly all laboratories have either north or east orientation. The southern wing contains the offices. The heat and undesirable lighting from the west were avoided in all but two of the laboratories.

Programs of Instruction

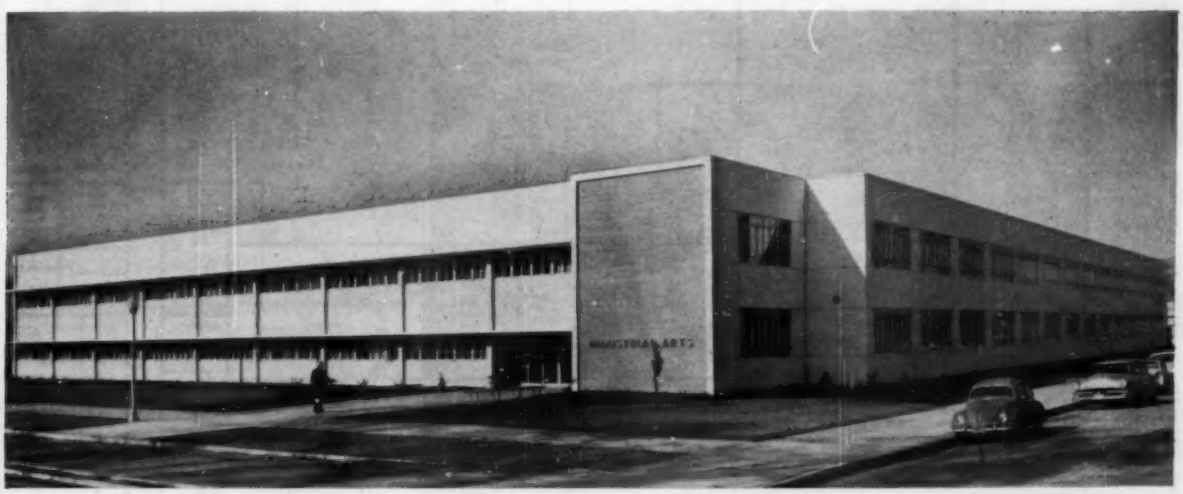
The building is designed to serve three different programs of instruction: (1) teacher education, (2) occupational instruction, and (3) general education and service courses. Twenty-three laboratories, twelve planning centers, two classrooms, central supply and numerous auxiliary rooms are provided for conducting these programs.

Teacher Education. Industrial arts teacher education, with nearly 200 undergraduate majors, is the largest program within the department. Future industrial arts teachers are provided instruction in the following areas: (1) industrial arts technical courses — 40 units; (2) professional education courses (including industrial arts professional courses and student teaching) — 28 units; (3) general education (including science, mathematics, social studies, physical education, fine arts, etc.) — 45 units; and (4) free electives — 11 units.

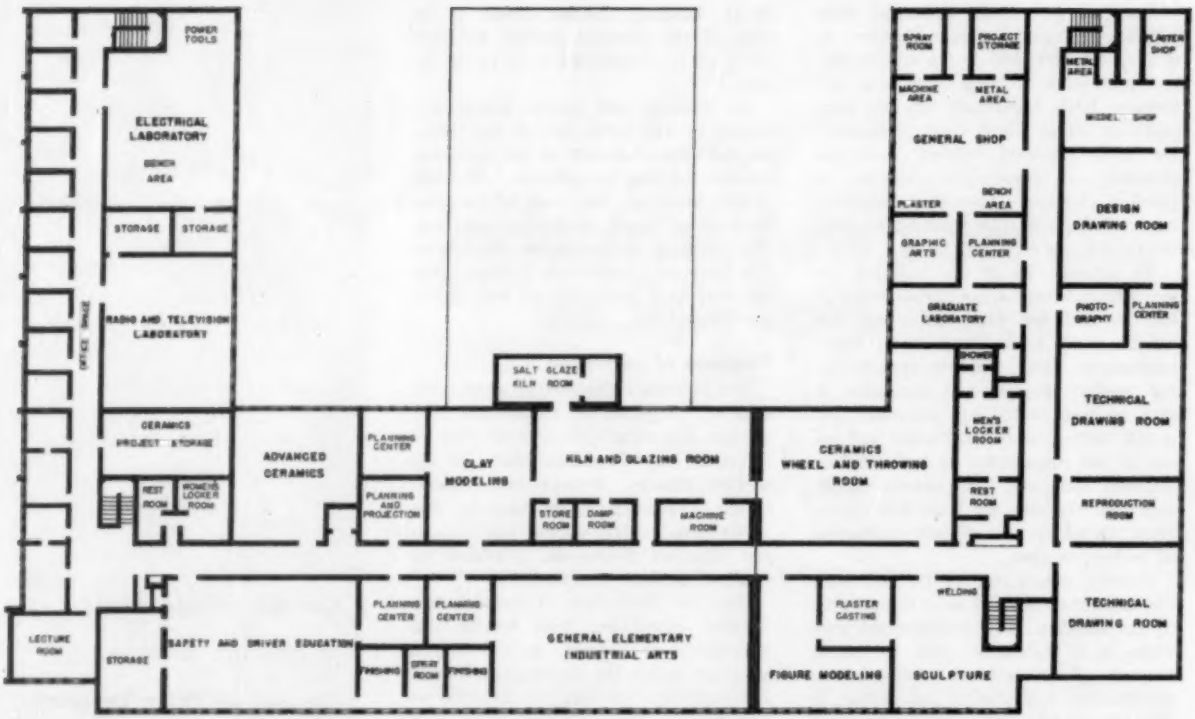
Industrial arts is viewed as the area of instruction responsible for developing a technical understanding of our industrial society. Instruction centers about the integration of art, science, and mathematics in the fabrication and

On the college level, a building designed to provide three programs of instruction: (1) teacher education, (2) occupational information, and (3) general education and service courses. . . .

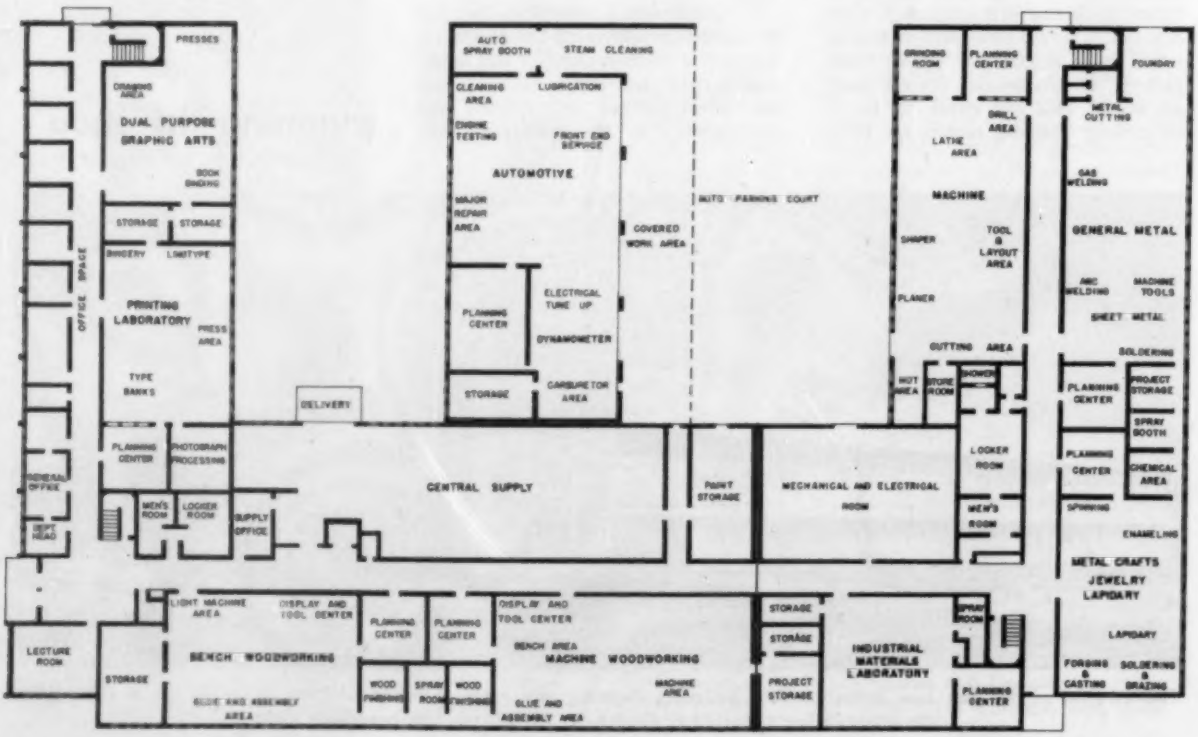
planning the shop



The exterior of the San Jose Industrial Arts Building, showing the main entrance and the office wing. Architects for the structure were Harold C. Guilkey & Associates, San Francisco, Calif.



The first (below) and second (above) floor plans of the San Jose State I-A building.



utilization of industrial materials and products. This interpretation includes experiences in industrial problem solving, design, skills, technical understanding, and attitudes toward our industrial society. As a result, technical courses spend one third of the time in lecture and two thirds in demonstrations and laboratory activities.

A graduate program leading to a master of arts degree is also offered in industrial arts teacher education. Prerequisites for this program include a valid teaching credential with a major in industrial arts. This program is designed to develop further depth and understanding into the professional problems of teacher education. To accomplish this, each student is required to take 6 to 8 units of graduate courses in the division of education plus 6 to 10 units of professional industrial arts courses. The integration of these two programs provides a better understanding of the role of industrial arts in the general program of instruction. A second objective of the graduate program is to provide students, through 10 to 12 units of directed electives, the opportunity to delve more deeply into technical areas or develop additional strength in the liberal arts.

Teacher preparation in safety and driver education is also part of the department. Students may either elect a combination teaching minor or select courses leading to the special teaching credential in this area.

Occupational Instruction. Two programs within the department lead to employment in industry. The largest combines business with technical industrial arts courses into a business and industry major. This program trains people to enter industrial employment requiring a combination of industrial and business experiences.

The newest program in the department prepares industrial designers. This program officially introduced in September, 1960, has already over 50 majors. Preparation for this exacting area involves a combination of industrial arts, fine arts, and engineering coupled with a 19 unit sequence of courses for the industrial design majors only. Additional courses in business, mathematics, and science are integrated with the general education requirement of the college.

General Education and Service Areas. Each student graduating from San Jose State College must complete 45 units of general education. A student may elect part of this core in industrial arts courses. As a result, the department is able to serve students with varying backgrounds representing numerous programs on campus. This activity provides both faculty and students the opportunity to apply the basic principles of industrial arts as a part of general education. Other campus programs include industrial arts courses as preparation for their major, thereby increasing the campus utilization of the building.

Instructional Laboratories and Equipment

1. *Automotive Area.* This program is designed to offer basic and advanced experiences in various facets of power mechanics. Emphasis is placed in automotive preventative maintenance, general engine, and engine accessory performance testing and maintenance, as well as major engine overhaul.

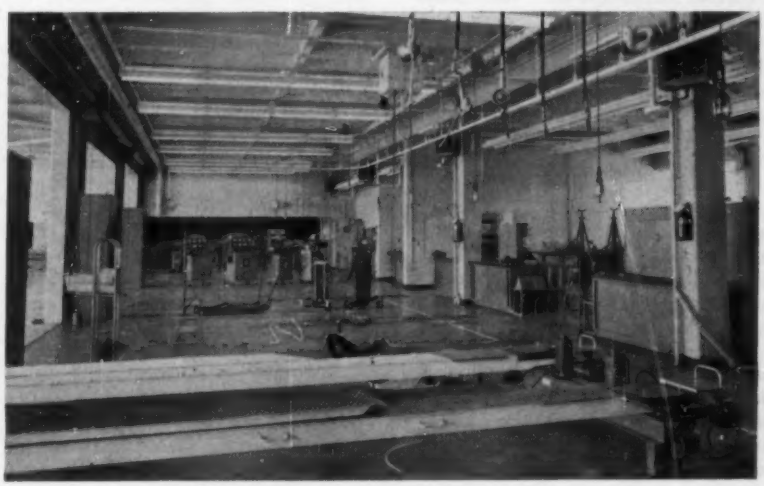
To support these programs, this area utilizes the full center wing of this building. This is a single story wing to accommodate the added height of automobiles on hoists.

The area is divided into major activities and appropriate equipment installed in the vicinity to best serve the activities, thereby eliminating excessive student movement during laboratory time. Some of the various work stations within the laboratory include carburetor overhaul, vehicle load and simulated road testing, battery checking and charging, generator testing and overhaul, distributor overhaul, general tune-up, hydraulic brakes, front end alignment, lubrication, parts cleaning, special tool and equipment storage, grinding, lathe turning, welding, engine overhaul, valve grinding, pin fitting, piston alignment, reboring, steam cleaning, and painting, plus numerous student work stations.

The tools and equipment to support the program include an adequate supply and array of typical automotive service and testing tools along with the following major items:

1. Drive on dynamometer complete with instrument panel including vehicle speed, engine R.P.M., manifold pressure, exhaust gas analyzer, brake horsepower reading and cooling system heat exchanger.
2. Electronic controlled front end alignment equipment.
3. Five dual-post hoists.
4. Eight workbenches fitted with basic tool cabinet in front of each service area station.
5. Complete lubrication unit with overhead reels.
6. Lathe and supporting accessories.
7. Automotive paint spray booth.
8. Outside steam cleaning area under canopy.
9. Engine dynamometer with scale and universal engine stand.
10. Complete valve grinding and general housing equipment.
11. Reboring bars.
12. Numerous electronic engine testing devices.

Facilities include the main automotive lab with an adjoining covered area which will accommodate eight vehicles (mild climate in this area makes this covered space very desirable), fenced-in



Two views of the spacious, well-lighted automotive area, showing, (below) the general service, tune-up, and wheel alignment equipment and (above) the component part testing and analysis equipment.

parking yard for twenty vehicles, adequate supply storage room, spacious acoustically treated classroom with counter space for visual aids and lab library, and well-lighted carburetor area.

2. *Electronic Area.* The several courses offered in the electronic area range from the basic understanding and application of electrical principles to modern electronic theory.

Student activities include numerous electrical and electronic fabrication activities plus testing and servicing problems.

To support the programs two laboratories with adequate supporting testing, working, and storage facilities are provided. In addition, the basic lab is equipped with electrical and metal working equipment enabling students to fabricate many electrical and electronic devices, including chassis, as well as having facilities for such activities as electroplating and motor and transformer winding. A large electrical distribution panel provides several varieties of power as well as considerable flexibility in power output.

The advanced laboratory also has the normal electrical testing equipment. In addition, it has facilities to test and service radios, televisions, and general electronic equipment. Other added features include six acoustically treated individual servicing booths, a well-equipped amateur radio room, complete electrical distribution panel, colored television, flexible plastic pipe antenna outlets to roof, and ample storage facilities.

3. *General Metals.* This area provides study and experience in basic metal working practice through activities employing bench metal problems, oxyacetylene welding, arc welding, heli-arc welding, metal forging, sheet metal layout and forming, machine tool work, metal casting, and various forms of heat treating. The program also includess introduction of principles of metallurgy as well as an understanding of common industrial metals and their many manufacturing processes.

The laboratory was planned with these activities and objectives in mind and, as a result, incorporates foundry, gas welding, arc welding, machine tool, sheet-metal, and forging areas. Special facilities, such as storage for sheet and bar metal, oxygen, acetylene and student projects were provided along with a well-equipped finishing room, a planning center furnished with layout and drawing benches. A large spray room is shared with the adjoining metal crafts area.

4. *Graphic Arts.* Two laboratories are designed to reflect a wide curricula offering for business and industry majors, industrial arts teaching majors, industrial designers, journalists, commercial artists, occupational therapists, and general education majors. The program strives to mirror the diversification of the industry on a national level as well as meet the needs of students specializing in a particular field of endeavor. This includes understandings and experiences in the fundamentals of typography and letterpress, bookbinding, silk screen printing, craft printing, camera and plate-making work, and lithography.

To support these programs, one laboratory was designed to include space for layout and drawing activities, book binding, craft printing, silk screen, and the normal letter press printing facilities offering hand and power operated platen press experiences.

The second lab was designed to incorporate experiences in bindery, linotype, cold-type, lithography, hand presses, power driven hand fed presses, and automatic fed presses. A photo room complete with copy camera, developing sinks, arc lights, line-up tables, and plate making equipment are included in this laboratory.

This area also has two paper storage rooms each with 93 paper storage shelves and a work bench section. A connecting doorway joining both storage rooms permits better utilization of materials common to both laboratories as well as greater storage flexibility.

5. *General Shop.* This facility is designed for both an occupational therapy service course and an industrial arts general education course now being developed.

The occupational therapy course involves activities which will help students become familiar with the use and care of numerous hand and light power driven tools. Students will be able to work with wood, light metal, and plastics when developing study problems from a therapist's point of view.

This facility is also planned for the industrial arts general education course open to all college students. In addition to wood, metal and plastic working tools and equipment mentioned above, the laboratory is also equipped with minimum requirements for electrical, graphic arts, foundry, and general crafts enabling these students to explore various facets of numerous industrial materials.

Facilities for this varied program include the main laboratory, graphic arts, spray, planning and material storage room.

6. *Graduate Laboratory.* To accommodate the specific needs of graduate industrial arts students, a special area was designed and planned. After evaluating these needs, the laboratory was equipped with individual student desks, a statistical calculator, mathematical and statistical typewriters, micro-film reader and photo-copy machine, conference table, filing cases, drawing and planning units, and bookcases.

Graduate students can study and work on research problems, plan technical activities, conduct seminar meetings, or study. Tools and equipment were purposely left out of this area thereby encouraging graduate students to utilize the facilities of the specialized laboratories or the general shop.

7. *Elementary Industrial Arts.* The industrial arts service program for elementary school teachers has been offered by the department for over 25 years. Student activities incorporate the use of soft woods, light metals, and plastics. Lab activities are oriented toward elementary education teaching problems.

The laboratory is equipped with hand tools, normally used in elementary school activities, and some light duty power tools. This enables prospective elementary teachers to develop the necessary tool skills to effectively conduct activity programs in conjunction with their social study, math, or science programs.

8. *Industrial Design Area.* These facilities serve both industrial arts and industrial design majors. Industrial arts teaching majors are offered the opportunity to study the design of industrial products, furniture and home appliances; in all cases this study emphasizes the basic principles of design, the role of the designer in industry and society, and the application of design in his particular area of specialization.

The B.S. degree in industrial design prepares the student to work closely with company engineers, advertising personnel and sales executives in the development of products that are industrially and economically practical, functional and have consumer acceptance.

To support both of these design programs the area has:

1. A modern design drawing room equipped with "L"-shaped drawing and working units with adjustable boards which can be elevated to a vertical position and special drafting machines that can be used with the boards at any angle.

2. A planning center which can be used for conferences and problem evaluation.

3. A model making area with equipment and facilities permitting the use of plaster, various types of metals, wood, plastic, and many other fibrous substances individually or in combinations.

4. A chalk board equipped with a wall vertical drafter for large layout work.

5. Tack board against available wall space from the floor to height of eight ft. for general display, criticism, and evaluation.

9. *Industrial Materials.* This facility offers students an opportunity to explore many industrial materials which cannot be adequately studied in the normal industrial arts laboratory and develop greater understanding in the common industrial arts materials. To accomplish this, the course involves a broad tech-

In the electronic area, students test equipment in advanced electricity. The student (in foreground) is working on electrically operated mercury pump developed in the course.

Two views of opposite corners of the general metal laboratory, indicating the diversified facilities of the area.

The graphic arts laboratory.

Elementary industrial arts.

nical study of materials such as wood, metal, and their alloys, fuels, lubricants, cutting oils or liquids, solvents, protective compounds or coatings, decorative finishes, printing inks, adhesives or binders, abrasives, plastics, etc.

To support this program special compounding and testing equipment such as microscopes, moisture meter, oven, compound mixers, taber abraser, various paint and ink testing gauges, viscosimeters, oil and grease testing equipment, paint and ink mill, ball mill, spectrograph, centrifuge, PH meter, metal testing furnaces, metal specimen polishers, rockwell hardness tester, balances, and other supporting small tools are included.

Since much of the equipment can be used in more than one area of study, housing and using this equipment in one central laboratory allows considerable savings. Students and teachers are able to develop a program with greater depth in the study and understanding of many technical aspects of industrial materials.

The laboratory facilities include three large laboratory tables and an instructor's demonstration table, all treated with stainless steel tops and having electricity, water, gas, and air outlets. The laboratory also has adequate counter space for much of the special testing and compounding equipment. Other facilities included are dual fume hoods, water fall type paint spray booth, planning center and storage room.

10. *Machine Shop.* The machine shop program involves three principal courses. The first develops basic understandings and experiences related to layout, hand tools, supporting service, materials, lathe, drill press, and other general processes of metalworking. The second involves more intricate metalworking problems and employs additional tools such as shapers, milling machines, including dividing head and spiral milling, gear calculation and grinding machines. The third course reinforces previously learned experiences and adds tool and die work, maintenance of machines, as well as selection and installation of machine tools in school or industrial shop.

Equipment to support this program includes ten engine lathes ranging in size from 10 to 17 in., two horizontal milling machines, one vertical mill equipped with dial indicators and end measures for jig boring, two shapers, one four ft. hydraulic planer, one three ft. arm 9 in. column radial drill, three small drill presses and other normal machine shop equipment.

A well-equipped grinding room containing reciprocating table surface grinder, a rotary table surface grinder, a tool and cutter grinder and a universal cylindrical grinder is provided along with a planning room, a hot metal area, and a storage room.

11. *Metal Crafts.* The laboratory is planned and equipped for the multiple activities which are offered in metal crafts, art metal, plastics, lapidary and jewelry. These are offered as elective classes and are normally taken by art, industrial arts, and industrial design majors and minors.

A bench area of 24 stations is arranged in the center of the room for convenient access to a large chalk board covered tool panel. Surrounding the bench section are smaller completely equipped areas for soldering, welding, annealing, metal spinning, forging, casting, enameling, and lapidary. Etching, plating, and metal finishing are accomplished in vented rooms adjoining the laboratory. The adjacent planning center is used for lectures, discussions, films, displays, and lab library materials.

The operating supplies and materials are stored in the laboratory where they can be easily selected, cut, weighed, and recorded. Student lockers, which accommodate practically all project materials, are built into the workbenches.

12. *Safety and Driver Education.* Safety and driver education incorporates courses in safety education, driver education, advanced driver education, administration and supervision, and readings and research. Teachers are prepared to assume responsibilities of instruction and supervision in both school safety and driver education programs.

Special laboratory equipment to supplement this program includes several types of driver simulators, a variety of devices for testing visual characteristics of drivers, reaction time and other psycho-physical factors of importance, cutaway sections of moving parts of the automobile, magnetic boards and other types of visual presentations to enrich instruction and prepare teachers in the use of these devices. Display cases and bulletin boards offer teachers and students the opportunity to provide continuous safety exhibits as well as enabling students to secure additional information about available materials.

13. *Technical Drawing Area.* This area consists of two spacious drawing rooms and deals with many facets of the industrial language and encompasses numerous mechanical, architectural, design, and communication problems. Both of these rooms are equipped with working units consisting of a four post drawing table and a metal drawer cabinet for student storage. The room for basic courses has its drawing boards equipped with parallel bars while the advanced drawing room has its drawing boards equipped with drafting machines. The chalk boards are nearly the full width of the room and are equipped with vertical drafters for large drafting problems. Also, ample tack board space is available for display and group evaluations of many drafting problems.

A reproduction room — equipped with blueprinting facilities including stainless steel sink and drying rack, two Diazo processing machines, opaque photo copying facilities, illuminated

Right: the area for industrial design. Far right: the lathe section of the machine shop, with electrical wiring in the floor to eliminate overhead obstructions.

tracing table, special drafting typewriters, architectural and builders surveying instruments, storage for all drafting equipment and supplies, and numerous small special devices associated with school or industrial drawing activities — is located between the two drawing rooms.

14. *Woodworking Area.* Two laboratories are included to service the woodworking area. One is designed to accommodate basic woodworking activities which involve the designing and fabrication of rather small wood objects employing the use and care of hand tools and light power operated woodworking machines. Facilities to accommodate upholstery and wood finishing activities are also included in this laboratory. The advanced wood laboratory is designed to expose students to some industrial type production equipment and also enable them to move into the design and fabrication of more complex furniture problems.

Along with the numerous light duty equipment, the advanced woodworking laboratory has a 24 in. surfacer, 8 and 12 in. jointer, dual arbor 16 in. circular saw, 30 in. band saw, spindle sander, horizontal boring machine, mortiser, shaper, veneer press, universal tool grinder and 8 in. by 10 ft. horizontal belt furniture sander with 32 in. by 8 ft. working table.

This area also includes a 12 in. spray booth used by both laboratories. Each laboratory has its own 12 by 20 ft. finishing room along with adequate space for material and project storage, and planning and development of problems.

15. *Art Facilities.* Because of the complex nature of problems related to the use of ceramic and sculpture materials, these activities are placed in the industrial arts building even though they are a part of the campus' fine arts program.

The ceramic program includes the study of both the art and industrial aspects of ceramic materials utilization. This consists of a complete curriculum in ceramic art in which students explore the possibilities of clay as a plastic medium for creative expression. Hand building processes, potters wheel experiences, ceramic glaze calculations, design for ceramic production processes and ceramic sculpture are all part of the offerings.

A technical curriculum is also being developed which will ultimately provide study and experiences in many industrial aspects of the ceramic field including material processing and production technology.

The laboratories are excellently equipped with facilities which will permit maximum development of both curricula. The equipment permits comprehensive study and experimentation in ceramic processes and production on the industrial level as well as in the art field.

Some of the major equipment and facilities include:

1. Twelve kilns, which will accommodate experimentation and production firing up to 3000° F., and a frit furnace.

2. Processing equipment including blungers, filter presses, a pug mill, a hammer mill, ball mills, a muller, a multiple purpose press, jigger wheels, plaster wheels, throwing wheels, and spray booths for glazing.

3. A complete laboratory for hand building processes and modeling equipped with bench whirlers, modeling tables and all facilities for coil and slab construction.

4. Other supporting laboratories consist of a throwing room with adjacent planning center, a kiln room with an auxiliary laboratory for clay and glaze processing, a damp room with a humidifier, a glaze materials laboratory, a salt glaze kiln room, and an industrial processing laboratory. A projection room for audio visual presentations as well as a project storage room containing five hundred lockers are also provided.

Above: metal crafts room.
Below: modern drawing facilities.

Left: Industrial problem solving activities in the use and understanding of various industrial materials.
Far left: modern woodworking facilities.

Facilities for Expanding Industrial Education Programs

1. Easton's New T&I Department

JAMES O. TULE

Having recognized the need for a new senior high school, the school authorities of the Easton-Forks and Easton Area Joint High School Systems, with Edward Tracy as superintendent, requested the district's vocational craft advisory committee to submit plans and recommendations for new and larger vocational facilities to be included in this expansion program.

This group, about 65 in number and representing all types of manufacturing, service, and production employment within the area, undertook its assignment with both vigor and sincerity. After many hours of study and review, it turned over to the school board and architect detailed and specific reports recommending the trades to be taught, building and floor space requirements, and the necessary equipment in specific amounts, size, and exact layout within each shop area. Throughout all stages of committee work each teacher and the vocational director played a large part in the necessary planning and formation of ideas and needs.

Mr. Tule is director of vocational and industrial education, Easton-Forks and Easton Area Joint School Systems, Easton, Pa.

Form of the Building

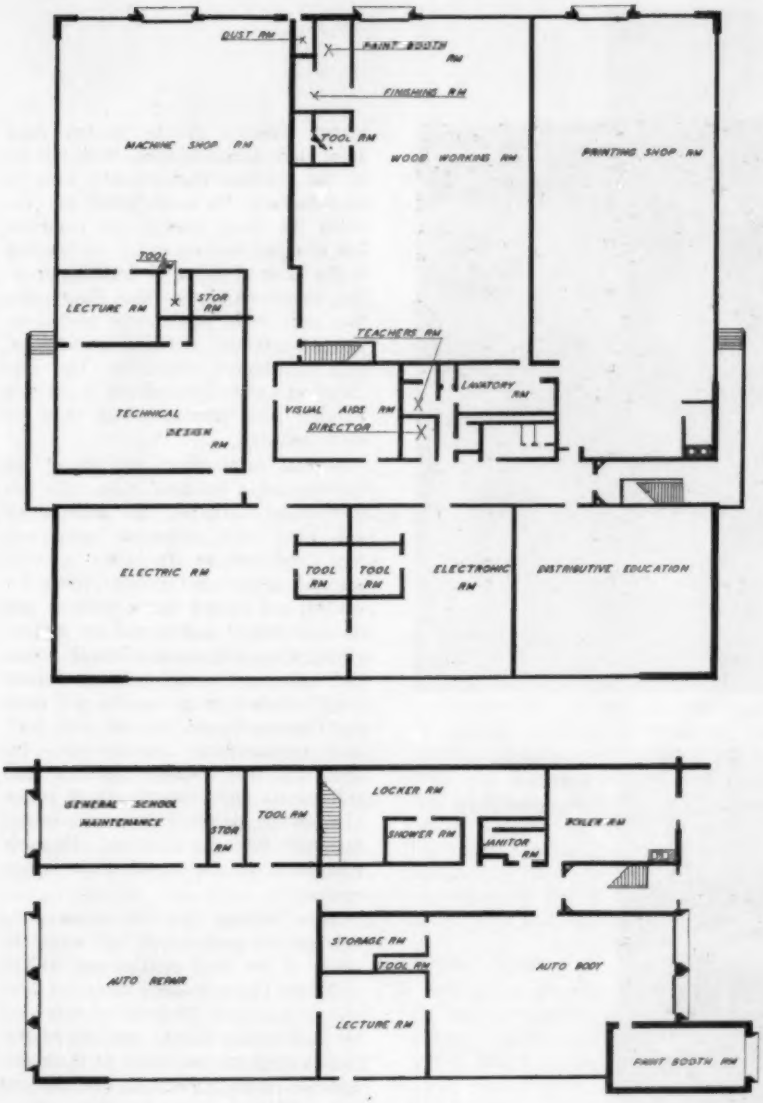
A number of questions might be asked by the observer of the resulting technical-industrial building: Why, for example, does the building have two stories? Why is it a separate building from the main building? Why is it located in this particular position on the site? And, what functional considerations caused the architects to come up with this particular solution to the problem?

The final form of the building finds antecedence in early Pennsylvania architecture. In a sense, the two-story T & I building is taken from an early American Pennsylvania Bank Barn. This seems not inappropriate for a school located at the historical forks of the Delaware.

The nature of the instructional courses made a separate building feasible; however, it was located adjacent to the cafeteria section of the main building.

The building is essentially a large square, 157 ft. in each direction, with a steel frame providing clear-spans of

An exterior view of the vocational building of the Easton Area High School.



On the high school level, two buildings designed to provide facilities for expanding programs in (1) trade and industry at Easton, and (2) industrial arts at Wewoka. . . .

planning the shop

52 ft. This makes for maximum flexibility within the space and permits possible future variations as technical and industrial instruction may change over the years.

Layout of the Building

The lower level includes two shops, the auto-body shop and the automotive-repair shop. These were wisely set at grade to take care of the heavy loading which these shops receive and each is accessible from its own service courtyard at each end. Between the two shops is located a classroom and tool and parts area which serves in each direction into the shops.

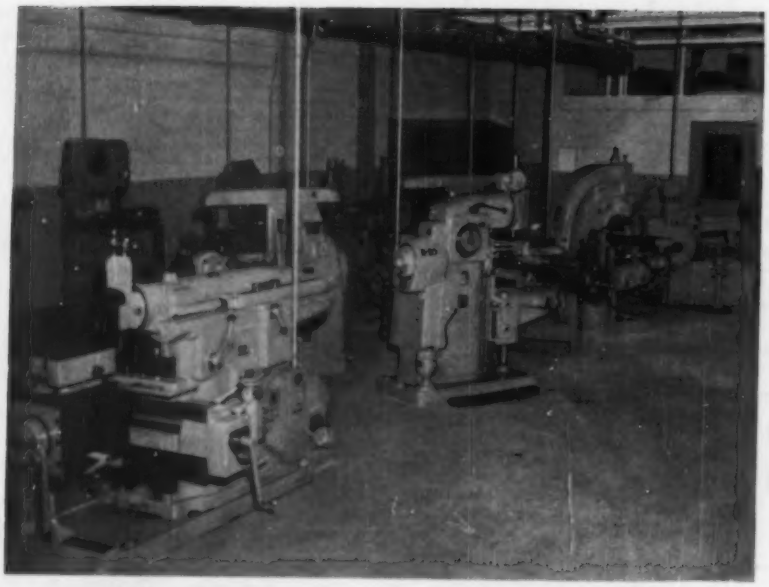
Above the automotive shops are located the "lighter weight" activities such as distributive education, electrical shop, and electronic shop. The drafting room and classrooms are located on the east end between the electrical shops and three "heavier duty" shops on the south, namely machine shop, woodworking, and printing. Lavatories and wash-up areas are located centrally and conveniently accessible to each shop. The three heavy duty shops, although on the upper level, are on grade to take care of the heavy loads with direct grade access along the south elevation. These shops are relatively large and although there are large window areas around the edges, it is supplemented by plastic skydomes through the central portions of the ceiling.

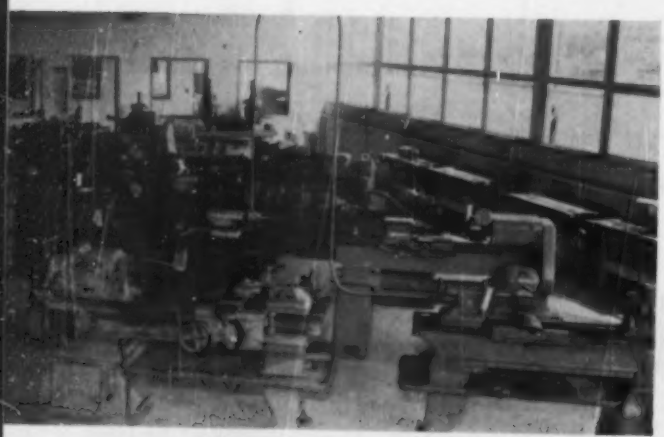
Although the shops are generously designed for today's requirements, we anticipated further expansion by allowing ample room to the east so that the building could be extended in that direction if it should prove desirable.

The building is simple in construction with the long-span steel joints exposed. Partitions in general are concrete blocks, also exposed, and all services to machinery are planned for flexibility. The exterior of the building, however, harmonizes with the finer finishes of the main high school building. Light steel framing with aluminum and glass curtain walls are expressed on the exterior while to the north two-story portion massive brick walls are carried down the full height to express stability. The north wall which faces one of the main approaches to the high school is a two-story curtain wall to correspond with the main building and to take maximum of the north exposure.

Equipment and Features

With the opening of the doors of the new trade and industrial building new horizons have been opened to noncollege-





Two views of Easton's machine shop.

bound students of the Easton Area Joint High School System. With the aid of the Defense Department's loan of machine tools, the local district has provided the most modern and complete line of equipment necessary for training in the fields of technical drafting, printing, woodworking, machine shop practice, auto body repair, auto engine repair, electronics, electrical technology, and distributive education. The machines and equipment placed in the new building now simulate those used by local industry.

Several outstanding features of the building are a teachers' room with private toilet facilities; an audio-visual aids room with projection equipment, film, and storage facilities; a well-planned locker and shower room for student and faculty use; a moisture and oil free central compressed air supply; effective temperature and humidity control systems for the printing department; modern spray booths and paint spraying equipment for the auto body and woodworking departments; the latest and most modern electrical control panels and laboratory test equipment in the electrical departments; and hydraulic lifts and front-end alignment equipment in the automotive departments.

This building has the potential of serving 500 students. It will meet the needs of the local district and will fit well into Pennsylvania's plans for area technical schools. Planning of this kind by local school boards and administrators is truly an indication of their recognition of the importance of trade and industrial training in American education.

Composition area in the printing department.

Machine area of the school's woodworking room.

Facilities for Expanding Industrial Education Programs...

2. An Industrial Arts Building

The Wewoka, Okla., schools under the administration of superintendent Ray Claiborne, recently expanded their high school campus with the addition of a new industrial arts building. Their architect-engineer, Hudgins-Thompson-Ball and Associates of Oklahoma City, were instructed to design a building which would blend with the existing development on the campus, but would be contemporary in appearance. Like all school projects, the costs of the new structure were to be closely watched, and a goal of around $9 per square foot was followed.

In order to house a large woodworking room, a drafting room, a welding room, an office for the supervisor, Mr. Loyd Nash, and the many auxiliary rooms for showers, lockers, storage, paint spraying and storage, it was agreed to look for savings in the structural design. After reviewing several systems, load bearing masonry walls with metal joists and exposed decking was chosen.

The decking, a fibrous material bound in cement, is highly fire-resistant, has good acoustical qualities and arrives from the factory with a soft white finish. The metal joists were ordered with a black rust preventive paint which contrasted the black metal lattice work against the white decking and supplied an attractive ceiling that was finished at no extra cost when erected.

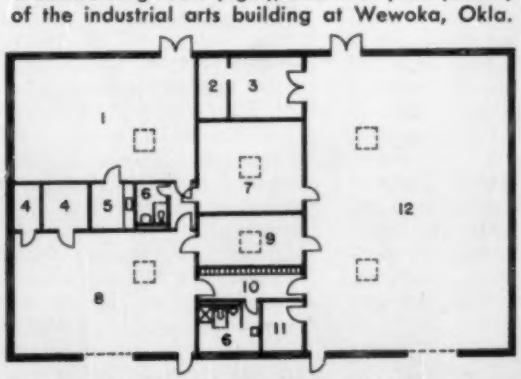
Interior Finish

All rooms are light and airy due to the large windows, the newest fluorescent lighting and the spacing of sky lights. Although the concrete block interior walls were left unpainted, a bright appearance was achieved by coordinating the colors of all trim. A large part of the contemporary finish of the building is due to the careful thought given to the detailing and the finish of the exterior. A mingle brick was chosen for the load bearing exterior walls which harmonized with the existing buildings, but contrasted panels of black brick were used above the windows.

A Trim Appearance

The walls above and below the windows are recessed from the main plane of the building to give a clean-cut appearance. The windows are painted black to match the brick panels, and a carefully chosen shade of red was used on all doors for an accent. The top of the building is trimmed with a black fascia and a gray gravel guard. An aluminum sign with large bold letters silhouetted against the brick identifies the building.

Woodworking room (right), and floor plan (below) of the industrial arts building at Wewoka, Okla.



1, mechanical drawing; 2, spray booth; 3 finish room; 4, storage; 5, blueprint and storage; 6, toilet; 7, project storage; 8, welding and repair; 9, lumber storage; 10, locker room; 11, office; 12, woodwork shop

New York's Aviation High School

FRANK WOEHR

Aviation High School in Long Island City is located just across the East River from New York City's Times Square. It is only minutes by car from LaGuardia Airport and about a half hour's ride from Idlewild. A lion's share of the central offices of many national airlines and our nation's largest aeronautics manufacturers (Pan-American, TWA, Eastern Airlines, United Airlines, American Airlines, Grumman, Republic, Sperry, etc.) are located in the metropolitan area.

This New York City location has helped to make the school the largest public aviation high school in the country with a register of 2300 New York City students and 120 teachers. Begun as a building trades school in Manhattan in 1925, it became an all-aviation high school in 1936 and is this year celebrating its 25th anniversary as a school organization. Aviation High School moved to its present location, an eight million dollar building on Queens Boulevard and 35th Street in Long Island City, two years ago.

Most Modern Facilities

The technologically advanced facilities in the new Aviation High School evidence the concern of New York's board of education and the administration for the best type of education procedures and processes, as well as their determination to keep vocational training in step with advancements in the aviation industry. Graduates are prepared to enter the aviation industry either as licensed FAA mechanics working for airlines or as production mechanics working in manufacture. The top 25 per cent of graduates continue their education in such higher institutions as engineering colleges.

Mr. Woehr is principal of Aviation High School, New York City, N. Y.

The school, occupying an entire block, contains 4,069,000 cubic feet of instructional area in five building units. There are two main structures, each seven stories in height. One contains the academic, technical, and administrative section with its five science laboratories and demonstration rooms, four mechanical drawing and art rooms, library, offices, medical suite, cafeteria, and 22 standard classrooms. The other houses 32 aviation mechanics shops, including a 20-foot water cascade spray booth. The shop activities are related to composite airframe construction, basic and advanced powerplant overhaul and maintenance, sheet metalwork, hydraulics, accessories, electricity, machine shopwork, gas and electric arc inert gas welding, and propeller repair and operation.

Maintenance Hangar

At right angle to the shop building is a three-story maintenance hangar of 15,000 square feet with 80 ft., electrically-operated doors. A large balcony provides space for testing the airworthiness of aircraft instruments, and the hydraulic, electrical, and electronic units of hangared aircraft. The hangar doors open on a concrete apron that is 15,000 square feet in area and equipped with fuel dispensing and storage units and aircraft "tie-downs," thereby providing outdoor experiences for the students in engine operation and aircraft handling.

Adjoining the hangar is a six-unit, engine-testing cell whose acoustical treatment assures a noise level less than existing street noises. The testing facilities permit the simultaneous operation of six reciprocating aircraft engines or two 1000 pound thrust aircraft jet powerplants.

The fifth unit in the school's layout is the gymnasium-auditorium section, four stories high, available to adults for after-school recreational and cultural activities.

Co-operative Planning

The school's facilities were planned with the advice of the teachers and the co-operation and assistance of the aeronautic educational commission, an affiliate of the board of education's advisory board for vocational and extension education. Through the co-operation of the commission, whose members include representatives of management, labor, and all branches of the Armed forces, Aviation High School serves not only as the city's central day high school for aviation, with a capacity of 2300 students, but also as the only public evening center for extension training of persons employed in the aviation industry.

Selected Students

Applicants must pass an aptitude and basic skills test for admission to the school. Each year 750 candidates are chosen from approximately 2500 applicants for admission. Test scores, reviews of record, and interviews are employed to screen applicants. At the present time about 40 per cent of the students admitted enter the 9th year as 8B graduates and about 60 per cent enter the 10th year as 9B (Junior High School) graduates.

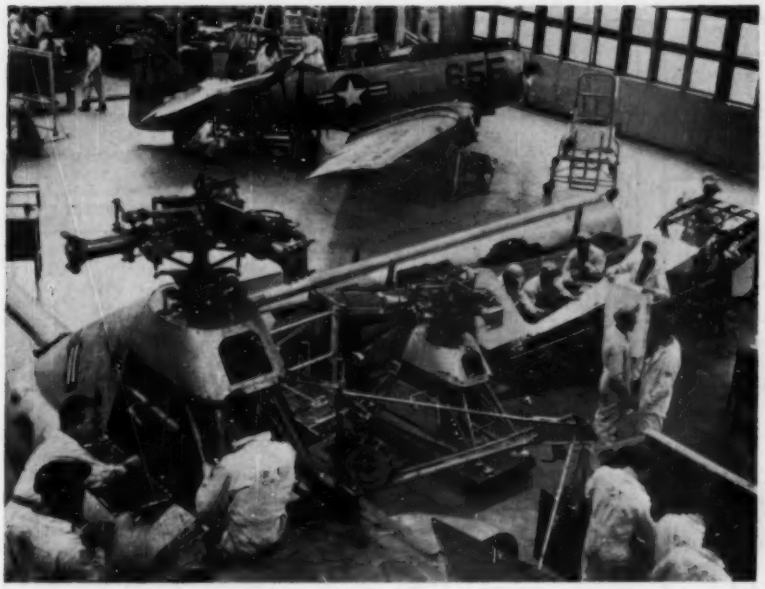
Courses Offered

Two terminal courses are offered:

1. *The Certified (FAA) Aviation Mechanic Course.* This terminal course provides the trade training and related information needed for employment upon graduation as an apprentice aviation mechanic.

2. *College Preparatory Aviation Mechanic Course.* This course provides the student with the subjects needed to meet requirements for admission to engineering college, and at the same time, provides the trade training needed for employment as an apprentice aviation mechanic.

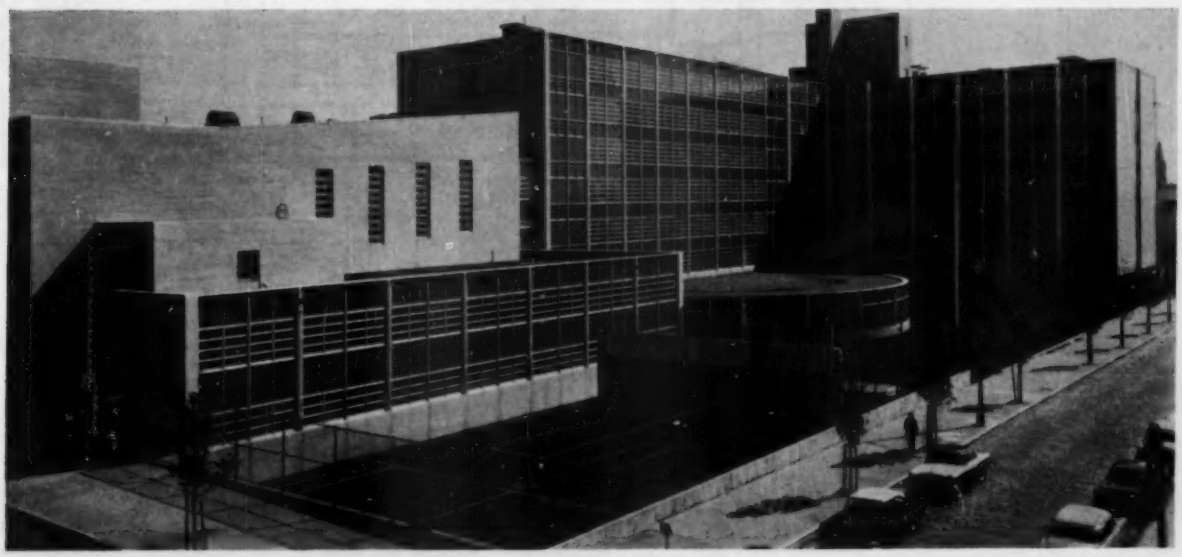
In the *9th year*, basic fundamentals



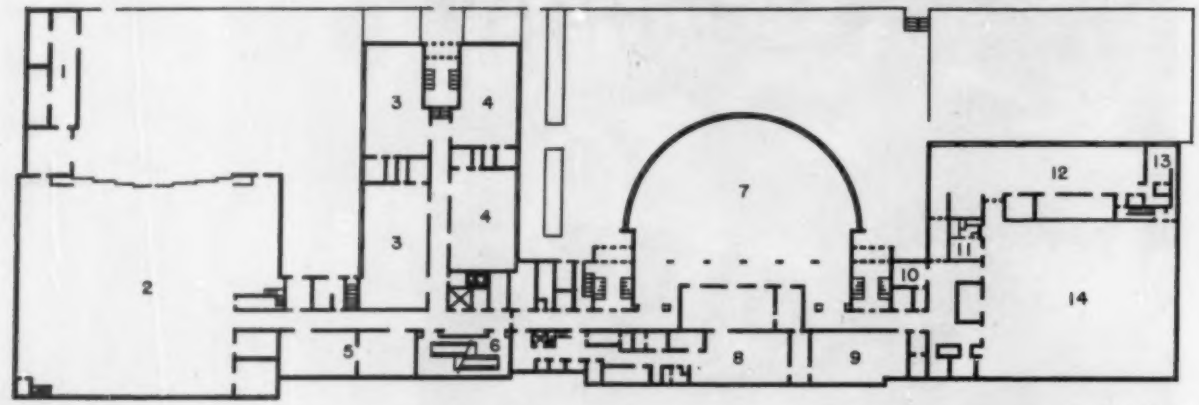
Above: a view of the aircraft and helicopter hangar. Below, left: the advanced engine shop. Below, right: testing tubing on hydraulic systems.

▶ On the high school level, specialized facilities designed to provide comprehensive approaches to (1) terminal mechanics courses, and (2) college preparatory mechanics courses . . .

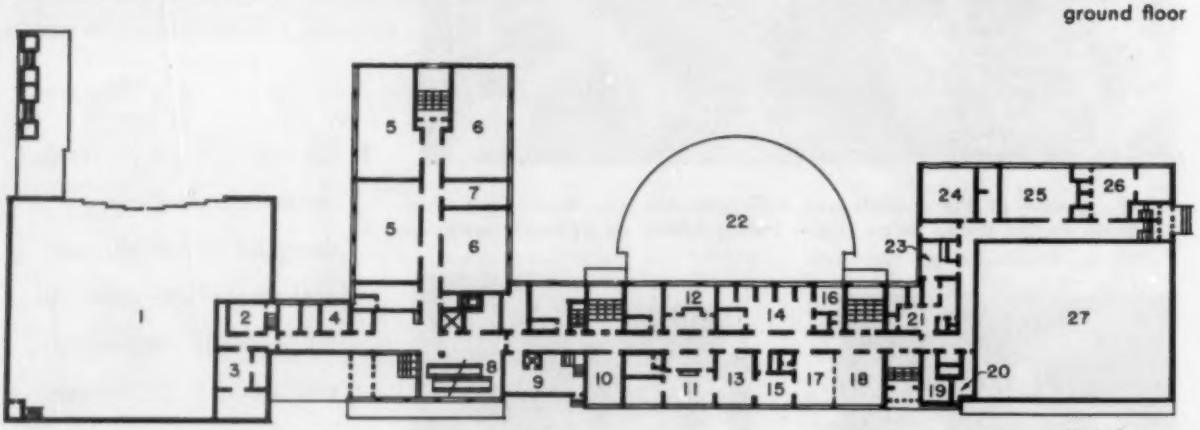
planning the shop



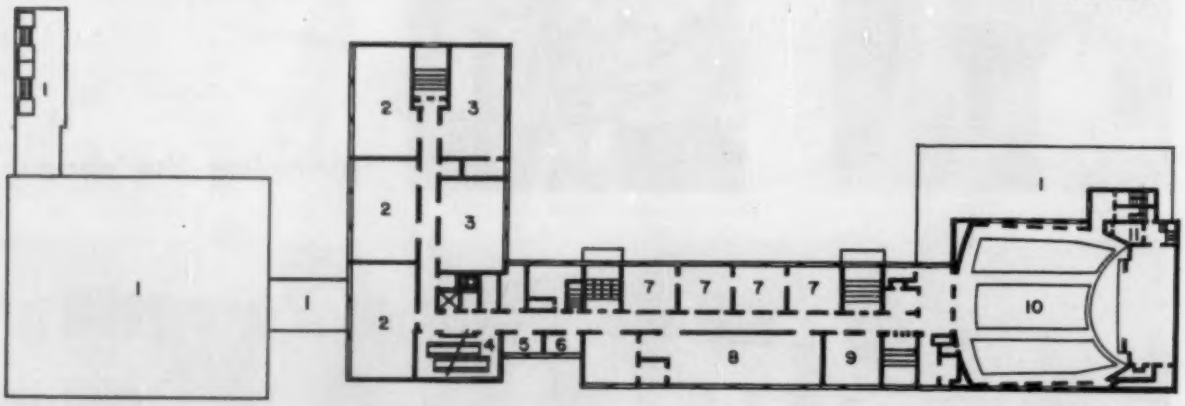
Exterior view of the multi-storied Aviation High School in New York.



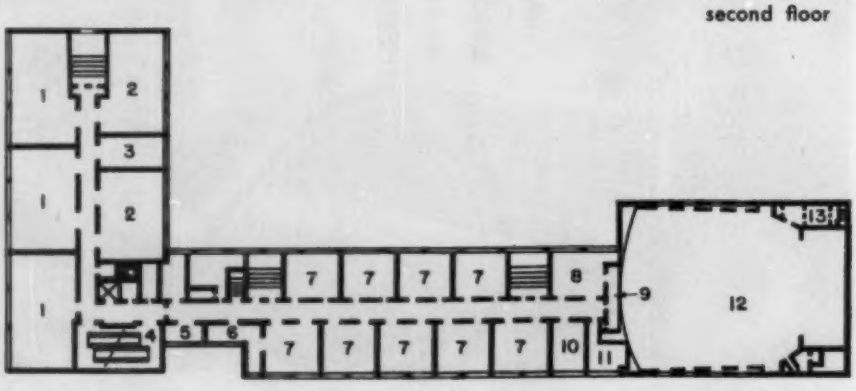
ground floor



first floor



second floor



third floor

ground floor

1, engine test building cells; 2, hanger; 3, advanced engine shops; 4, propellers shops; 5, storage; 6, escalator; 7, pupils' cafeteria; 8, kitchen; 9, teachers' cafeteria; 10, team room; 11, gym instructors' office; 12, pupils' locker room and showers; 13, visitors' locker room; 14, gymnasium.

first floor

1, upper part of hangar; 2, instrument room; 3, electronics room; 4, office of chairman of shop department; 5, hydraulics shops; 6, accessories shop; 7, shop office; 8, escalator; 9, general receiving; 10, night school office, attendance coordinator, college adviser; 11, general office; 12, office of administrative assistant, pupils' services; 13, office of administrative assistant, administration; 14, guidance suite; 15, principal's secretary; 16, counseling and programming office; 17, principal's office; 18, conference room; 19, custodian's office; 20, office of health education, department chairman; 21, medical suite, health counselor, school physician and school nurse; 22, roof; 23, emergency room; 24, hygiene room; 25, music room; 26, band practice room; 27, upper part of gymnasium.

second floor

1, roof; 2, sheet metal shops; 3, electric shops; 4, escalator; 5, storage; 6, visual aids office; 7, classrooms; 8, library; 9, library classroom; 10, auditorium; 11, dressing room.

third floor

1, sheet metal shops; 2, machine shops; 3, maintenance shop; 4, escalator; 5, storage; 6, office of chairman of English and social studies department; 7, classrooms; 8, general office and alumni office; 9, projection booth; 10, student publications; 11, sound control room; 12, upper part of auditorium; 13, dressing room.

fourth floor

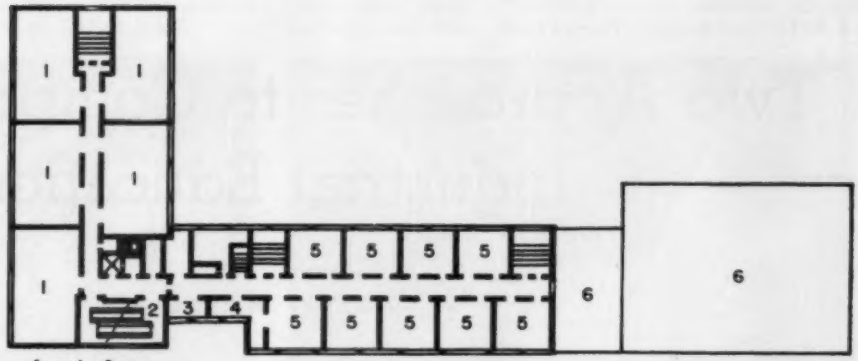
1, basic engine shops; 2, escalator; 3, storage; 4, office of chairman of mathematics and drawing department; 5, 430–438 classrooms; 6, roof.

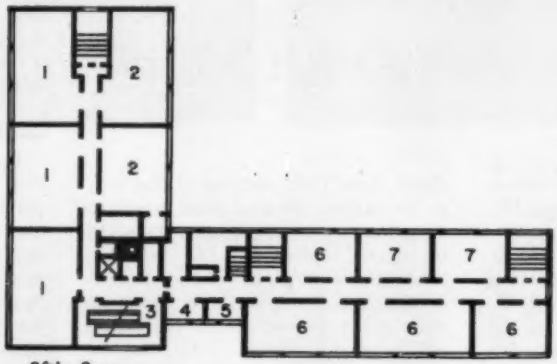
fifth floor

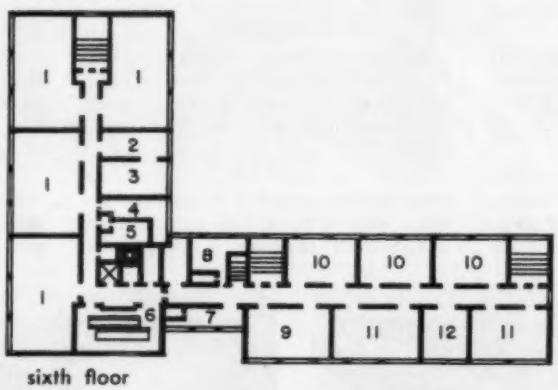
1, composite airframes shop; 2, welding shops; 3, escalator; 4, shop department office; 5, blueprint room; 6, drawing classrooms; 7, science classrooms.

sixth floor

1, composite airframes room; 2, storage; 3, spray room; 4, ham radio room; 5, darkroom; 6, escalator; 7, science preparatory room; 8, related tech. chairman's office; 9, chemistry lab; 10, science classrooms; 11, physics lab; 12, science preparatory room.







in drawing, hand skills and operation applicable to sheet metal are taught in exploratory shops. The rudiments of powerplant and woodworking are covered. Students build sheet metal and woodworking units, gliders, and jigs and they assemble model gliders. They run model aircraft engines — learning the functions of the units — and also assemble a plastic model aircraft engine.

In the *10th year*, composite airframe shop students are taught basic construction and repair of aircraft major components: fabrication and assembly of a wing section; working from blue prints; the use and care of hand and machine tools and assembly of parts.

Specialized trade skills are developed through the use of special equipment currently used in the manufacture, inspection, maintenance, repair, assembly, and alteration of structural aircraft units. Also taught are the handling of materials, layout, cutting, forming and fastening of aircraft sheet metal units. Federal Aeronautics Administration procedures are stressed.

Welding students learn the fundamentals of inspection, installation, and checking of electric aviation equipment in conformance with standard aircraft practices and procedures.

In the 11th year, hydraulic shops provide an opportunity for the students to acquire knowledge and skill in the installation of units in aircraft hydraulic

(Concluded on page 50)

Two Approaches to Comprehensive Industrial Education

WESLEY WIETING

1. Evanston Township High School

The educational program of Evanston Township High School in Evanston, Ill., traditionally emphasizes academic training because more than 90 per cent of the students continue their education in college. Following World War II, changing educational concepts on the part of the school leaders indicated a comprehensive background also should include instruction in industrial education.

This gave rise to Evanston's 1949 building expansion and its "Technical Arts" wing. Designed by Perkins & Will, architects of Chicago, Ill. and White Plains, New York, addition of this wing to the existing physical plant presented no problem. Master planning conceived by school leaders and the architect, Dwight H. Perkins, of Perkins, Fellows & Hamilton, contained provisions for this facility as well as all the others added to the original 1921 structure erected on the 55-acre site.

Mr. Wieting is Resources and Research Director for Perkins & Will, Architects, Chicago, Ill., and White Plains, N. Y.

The "L"-shaped technical arts wing oriented to the south and east, is exposed to all 3500 students comprising Evanston's enrollment. Located between the cafeteria and auditorium-music wing, this structure faces one of the academic courts.

In this two-story wing are complete shop facilities intended to acquaint students with technical arts as a part of culture itself. However, if students desire, the instruction received in this department can give both boys and girls a foundation in depth upon which they might build toward a journeyman's skill.

Corridors for Display

A distinctive characteristic of the first floor is the corridor treatment. A focal point here is the look-through, glass-enclosed display cases near the entrances to the art studios, ceramics laboratory, and the print shop. Added interest is found in the rub rail that can be utilized for mounted art work and the wall display surfaces. All hall lighting is designed to illuminate tackboard and wall rail display areas. Special lighting is provided for the recessed "look-through" displays. The pleasant, inspiring atmosphere of the long exhibition-like hall releases students from classroom tensions and gives them the opportunity to see the accomplishments of their fellow students.

Another feature of this corridor is the recessed entrances, so that doors do not swing out into the traffic pattern.

Two views of the woodworking shop at the Evanston Township High School.

Evanston's instructional material center includes a space for viewing demonstrations on technical arts.

The display case of Evanston's craft workshop of the technical arts area which permits showing craft projects.

A flexible, airy, well-lighted room at Evanston serves various arts and crafts activities.

▶ On the high school level, the industrial education departments of two comprehensive high schools which range from elementary industrial arts to terminal vocational educational. . . .

planning the shop

Above: the school's print shop. Right: the space for mechanical and architectural drawing courses.

These entrances are double, providing for two adjacent classrooms. Displays at shop entrances also are recessed to prevent damage and injury to the students in the crowded main corridors.

The First Floor

Building trades, power tool, general wood, general metal, and home mechanics rooms also are located on this floor. A long receiving dock, where material and heavy equipment is handled, is located across the hall from the shops. Adjacent to this space is a garage and student driver instruction facilities. Also included is an area for motor mounts and mock-ups, pre-driving studies, and inclement weather driving instruction.

In the interest of saving space, the shops were designed with a mezzanine. This area, overlooking the shops, contains instructors' offices, small classrooms, and storage space. Each pair of shops shares a lecture room on this level. The "flying bridge" device permits supervision of classes without the instructor's presence on the shop floor.

Included in the ceramics laboratory is a kiln room with electric furnace and sink entirely isolated from the rest of the building. The ceramics laboratory itself is separated from the crafts shop by a double glass partition to control humidity for ceramics work. Completing the first floor spaces is an instructional materials center. This area was originally designed as a projection room, but has been expanded as a workshop to permit editing, repair and film storage. The nonparallel walls of this room provide control of sound for visual aids and lecture purposes.

The Second Floor

Among the spaces on the second floor is a four-room photographic suite, containing a completely outfitted studio-classroom, film loading and developing room, office, and printing and enlarging darkroom.

Three mechanical drawing rooms, a food laboratory, and student and faculty lounges complete the second floor facilities. These lounges can be used individually or by opening connecting doors become a unit for social purposes and community functions.

Mechanics

Heating is accomplished by a remote self-contained boiler plant that serves the entire school. Convection heat is used in classrooms and art studios with forced air unit fan heaters in the larger shops augmented by fin convectors at the clerestory windows.

Structure and acoustical control is combined in the shops by use of a perforated metal deck. All shop walls of concrete block and ceiling surfaces are fireproof and abrasion resistant. Walls in other spaces are plaster, except in the visual-aids room where vertical cypress paneling was used. Acoustical plaster or perforated transite was applied in spaces requiring acoustical control. There are perforated acoustical tile ceilings in all but the larger shops. Vented steel sash is used throughout the learning spaces in this wing.

Pastel colors relieve the whites and grays of the technical arts spaces. A number of rooms have patterned draperies in keeping with the decor set in lounges, where window dressings repeat the pattern of the wallpaper.

A typical "flying deck" storage area with various size cabinets and drawers for the varied tools and equipment of a shop class.

Plans of the first and second floors of the Evanston Township high school area for industrial education.

2. Linton High School

Another comprehensive high school, designed by Perkins & Will in association with Ryder & Link, of Schenectady, N. Y., is Linton High School in Schenectady, opened in 1958.

Linton, located in industrial Schenectady, has some 1800 tenth, eleventh, and twelfth grade pupils. This high school, providing for academic and vocational training, was designed with the realization that 60 per cent of its students will receive a terminal education there.

Linton's "plant" made up of seven single structures, all connected and laid out on a 37-acre campus may at first remind both Schenectady and its visitors more of a contemporary industrial or commercial complex than of the traditional multi-story educational building.

The "Core-Techs" unit

Forming the heart of the campus is the "core-tech" unit, with its specialized shops, laboratories, work areas, and classrooms grouped under vocational and technical skills, arts, crafts, sciences, commerce, and family living.

Whether students are passing to and from academic teaching spaces, the library, or the auditorium and gymnasium, their paths take them through the core-techs. In this unit they move past an ever changing pattern of expansive windows and working display tackboards that contribute subtly to interest, understanding, enrichment, and incentive.

Except for the nine shops grouped together, the core-techs unit is air conditioned. Each principal area of the nine shops is completely furnished with a diversified collection of equipment for work, in a variety of materials — stone, wood, plastic, rubber, and metal. The students learn trades under conditions both as to layout and the use of equipment similar to commercial enterprises.

While the nine industrial shops form a separate area, drafting rooms, and teaching spaces for girls trades courses — dressmaking and beauty culture are located in other parts of the core-techs unit.

T & I Courses

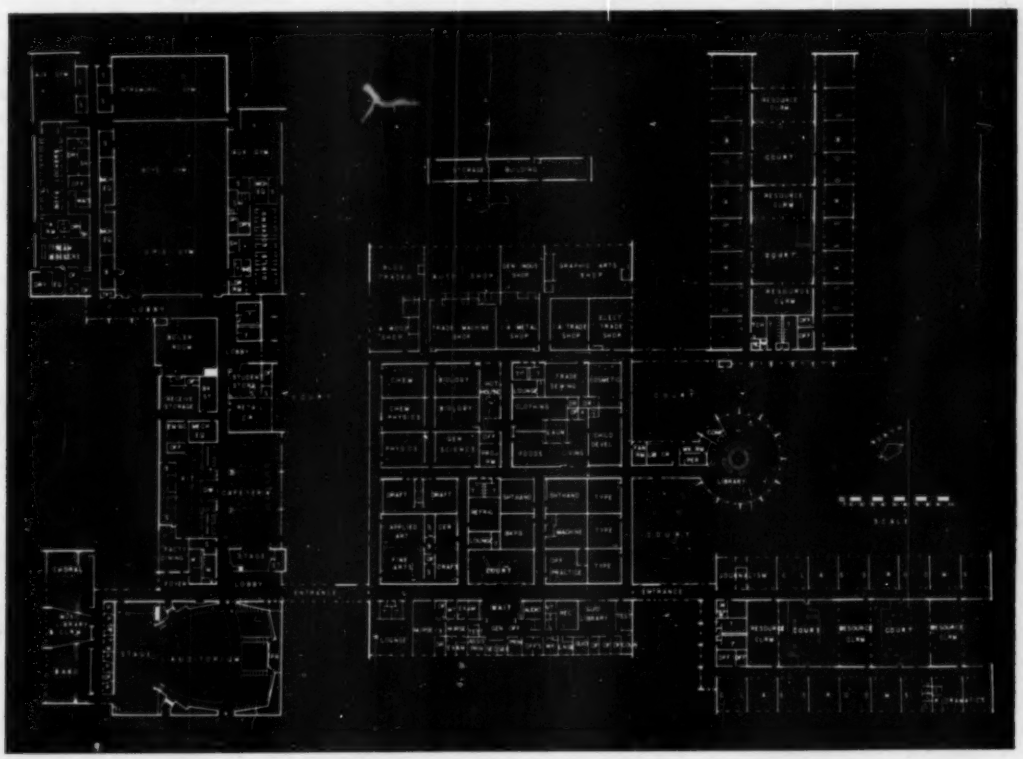
At Linton boys can take courses in the following trades: automobile mechanics, building trades, electricity and industrial electronics, general industrial, industrial drafting, machine shop and drafting. These courses offer training in preparation for future work in the several trades.

In the automobile mechanics course, the student learns both automobile repair and maintenance. Instruction includes the fundamentals of engine operation, transmission, and ignition. A large part of this course is made up of practical work. The opportunity also is given to become acquainted with the various specialized fields of auto repair.

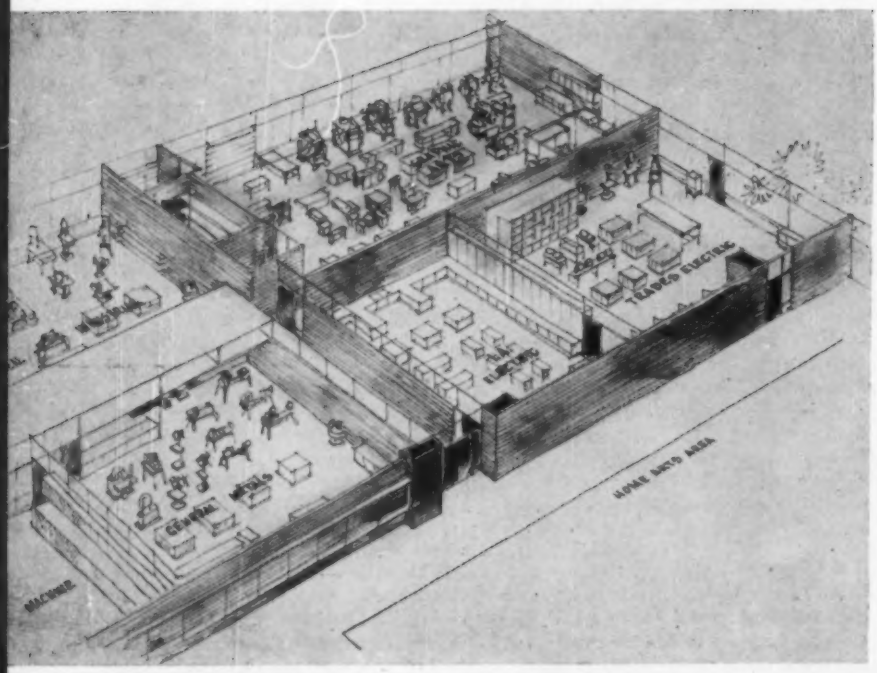
A student completing the course in electricity and industrial electronics can usually find employment in one of the many branches of the electrical field — electrical maintenance, electrical installation, appliance repair, motor rewinding, and automotive ignition.

Preparation for these types of employment, as far as practical, duplicates the work of the electrician on the job. Projects include both bell and house wiring, using armored and nonmetallic cable. Installation of electrical circuits using both rigid conduit and tin wall tubing is practiced. Testing, repairing, and rewinding motors and generators is an interesting phase of the work.

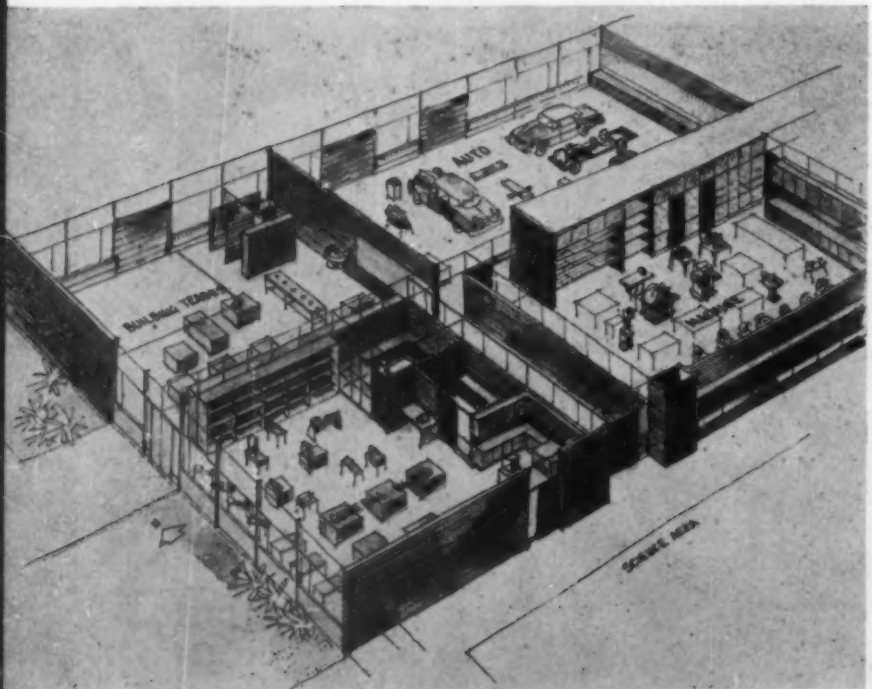
The trade machine shop course combines theory with practical experience in a shop equipped with modern machines. Included in the program is practice on lathes, milling machines, shapers, surface grinders, cylindrical grinders, drill presses and planers, as well as



Floor plan of the Linton High School in Schenectady, N. Y., showing the "core-techs" unit in the central area of the structure.



Perspectives of the industrial education area of Linton's "core-techs" unit.



bench work. Boys select and complete various projects such as the making of the following: band saw, circular saw, jig saw, wood lathe, joiner, metal shaper, or drill press.

The building trades course is built upon the new concept of building construction that co-ordinates a number of related trades. Instruction is not limited to carpentry, but also includes plumbing, heating, air conditioning, sheet metal work, and bricklaying.

Another trades course is industrial drafting. In this course the student learns how to make drawings from which blueprints are made. Not only does he learn how to handle the draftsman's instruments but he becomes familiar with shop practice which uses his drawings.

The general industrial course offers an opportunity to learn the basic skills of a variety of trades — painting, paper hanging, concrete work, shoe repair, automobile servicing, machine operation, and gardening and landscaping.

Printing is a twofold program — the college preparatory and the trade apprentice. The former preparing the student for college and later employment as estimators, production men, advertising, or sales representatives, or the like. The student following the trade program is ready to enter the printing field after high school as an apprentice or helper.

The co-operative industrial training program is another course at Linton, offered primarily for the seniors. This program is designed to assist students interested in a co-operative work-study plan to obtain training in occupations not offered in regular school programs.

Some of the occupations involved in this program are: automobile parts manager, automobile service station attendant, automobile body repairman, electrical appliance repairman, furniture upholsterer, dry cleaner, baker, copperplate printer, canteen service repairman, meat cutter, silk screen specialist, and greenhouse worker.

Industrial Arts

Rounding out the courses Linton has in shops is one entitled industrial arts. Students pursuing this curriculum take courses in exploratory shops — electrical, metal and woodworking — mechanical drawing, machine drawing, building trades drawing, electricity, electronics, general metal shop, advanced metal shop, and woodworking.

These courses provide an opportunity for the student to increase his consumer knowledge and to broaden his high school training by working with the tools used by engineers, technicians, and skilled craftsmen. They also enable the student to determine what craft skills, if any, he possesses and to develop these skills further.

Built-in Safety for I-E Facilities

EDWARD A. CAMPBELL

▶ In the area of engineering a shop for the elimination of safety hazards, here is a checklist of ideas for building in safety in a new shop. . . .

The students, instructor, and school have too much at stake to permit haphazardly engineering and planning of the industrial laboratory. In many instances accidents occur due to inadequate job or project analysis; as a result, the need for proper safety engineering is vital. Modern industry with its complex diversified activities has perfected specialized engineering techniques for job analysis and company policy in many instances dictates that safety must be designed into the job or operation. The administrator designing, arranging, and managing a shop program should include in his planning and follow-through such measures as to attain one of the accident prevention goals listed as follows (in order of effectiveness and preference):

1. Elimination of the hazard from the machine, method, material, or shop structure.
2. Guarding or otherwise minimizing the hazard at its source if the hazard cannot be eliminated.
3. Guarding the person of the operator through the use of personal protective equipment and devices if the hazard cannot be eliminated or guarded at its source.

Safety at the Beginning

The best time for elimination of hazard inherent in the laboratory design is prior to the initial design engineering. Preceding construction or remodeling strenuous thought should be given to the proposed operations, facilities, and materials. To accomplish this, a detailed, written study of all mechanical operations should be made (the aims and objectives of the proposed course may help). Such a syllabus will expose potential hazards and facilitate prompt installation of adequate preventative devices.

Mr. Campbell is a member of the department of vocational education, University of Pittsburgh.

planning the shop

In planning, equipping, and administering a shop program several principles are of utmost importance in preparing for machine layout, hazard elimination, and proper storage. It appears that shop accidents are a function of many factors, so in planning a shop layout for hazard elimination the following principles of shop planning and organization become basic:

1. Design in accordance with community requirements and in harmony with current educational philosophy and objectives.
2. A plan for the future as well as the present, employing the advice of experienced counselors and providing adequate facilities to permit readily supervised instruction.
3. Shop space per student on the basis of the type activity contemplated — 75 square feet per student should be the minimum.
4. Safety of the student in planning the type of machines, traffic patterns, electrical controls, and entire shop scheme and arrangement.
5. Adequate power wiring facilities.
6. Adequate storage space for raw materials and finished products.
7. Proper lighting facilities (only upon recommendation of a qualified lighting engineer).
8. Sound control reducing shop noise is essential.
9. A "cheap" shop becomes exceedingly expensive in the end.[1]

Additional References

These are general specifications for all shops. In addition it is extremely desirable that all areas of the industrial education laboratory be clearly visible to the instructor with all interior partitions half glass. Hazardous areas surrounding power machinery should be so arranged that the students are not endangered. Additional protection for the students and operator is often obtained by the use of safety zones painted on the floor adjacent to the machine.

Wide aisles facilitate efficient traffic flow between benches, machines, and storage areas. Special restricted areas should be allotted to areas where metal welding, heat treating, and so on are undertaken. In facilitating an efficient traffic pattern, tools and supplies should be placed adjacent to work areas for reduction of unnecessary traffic and interference.

All machines, power equipment, and tools should be located with reference to the sequence or association of operations inherent to specific machines such as the circular saw and jointer; spinning lathe and annealing furnace; forge and anvil; cut-off saw and lumber rack; power hack saw and metal storage; etc.

(Concluded on page 52)

[1]Delta Power Tool Division, Rockwell Manufacturing Company, *School Shops for Today and Tomorrow* (Pittsburgh, Pa.: Rockwell Manufacturing Co., 1956), p. 40.

▶ The fifth in a series of five articles on power mechanics, our rapidly emerging new instructional area —

Planning Facilities for the Course in Power Mechanics

CHARLES G. RISHER

Dr. Risher is shown below with a group of his students in power mechanics at Western Michigan University in Kalamazoo.

When planning the power mechanics facility, the decision must be made at the onset whether: (1) to plan a laboratory solely for power mechanics instruction; or (2) to plan a laboratory which lends itself to instruction in power mechanics as well as instruction in another industrial arts area which is closely related in content and equipment.

Of those instructional areas currently utilized for industrial instruction, basic electricity was the area selected for easiest combining with the power mechanics area. Instruction in each of these areas will find it advantageous to make use of the facilities available for the other instructional area.

The decision to organize a combined power mechanics-electricity laboratory rather than a single area power mechanics laboratory was twofold: (1) the belief that the integration of power mechanics with existing electricity areas would stimulate the expansion of power mechanics instruction more rapidly than would separate power mechanics instructional areas; and (2) to show the relatively simple changes and additions necessary to convert existing electricity areas to power mechanics-electricity areas.

Dr. Risher is an assistant professor of industrial education at Western Michigan University, Kalamazoo.

A Combination Plan

To illustrate the facilities of a power mechanics-electricity area, a possible combination laboratory plan is shown. The planning is of the "ideal" situation. Seldom is this situation found, but it is a goal toward which laboratory planning activities should be directed. A separate store room is desirable for power mechanics in that student projects will not lend themselves to the drawers and lockers usually provided for the storage of live projects.

Because current electricity is the ultimate result of numerous applications of combustion engines, the demonstration engines will provide meaningful instruction to the electricity students as well as power mechanics students. When transmitted current electricity is consumed, much of it produces rotating or linear motion. The application of current electricity to produce mechanical, hydraulic, or pneumatic power is explained and made understandable in

these respective areas of this combination laboratory.

In the combined laboratory as proposed, there are five stations in which engines may be run inside the laboratory. One of these is a test tank containing approximately 125 gallons of water where outboard motors may be operated under "on the water" conditions. The other four running stations are designed for the low horsepower, "lawn mower" type engines. Two of these stations are equipped with apparatus for securing data necessary for calculating the brake horsepower of specific engines. The engine mounting facilities are such that either laboratory engines or student owned engines may be operated at these running stations.

Solving Three Problems

Running engines within the laboratory presents three problems: exhaust gases, noise, and gases and odors other than exhaust gases. These problems are encountered elsewhere within a comprehensive high school and steps are taken to alleviate them. Gases and objectionable odors occur in chemistry laboratories, and fan evacuated hoods cope with this problem there. Noise is encountered in physical education gymnasium classes and band practice rooms. Soundproofing these facilities provides solutions there.

Exhaust gases may be removed by a fan evacuated system designed for the purpose. These systems usually include an expansion chamber as a sound muffling feature. Combustion noises may be reduced by utilizing wooden tables for the running stations rather than steel tables, which are frequently recommended for the purpose. Covering the engine exhaust stacks with glass fiber or cellular steam pipe insulation will also reduce combustion noises.

The gases and odors other than exhaust gases will originate, primarily, from the battery charging unit, electroplating unit, and from running engines. These gases and odors may be removed by a ventilating hood designed for this purpose and operated independent of the engine exhaust system and the building ventilating system.

The power mechanics-electricity laboratory will require that a minimum amount of gasoline be available for gasoline engine operation. The amount kept available will vary with the number of engines operated. In any event it will necessitate the instructor acquainting himself with the volatile liquid clauses in the fire regulations and/or appropriate clauses of building insurance policies. This information will apply as equally to volatile finishing materials as to gasoline.

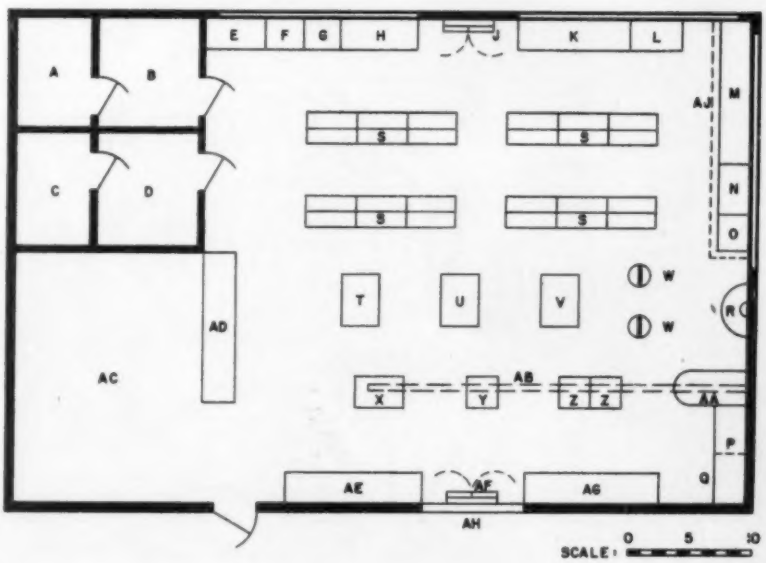
An Expanding Program

Power mechanics is an expanding program. Presented in this series of articles have been an explanation of the significance of applied power in the development of a technology centered culture; the suggested content of a course to make the significance of this applied power a part of the knowledge of high school people; suggestions for resource material, equipment, supplies and the plan for incorporating power mechanics with a currently functioning industrial arts instructional area. We have attempted to present possible solutions to some of the more obvious problems, but additional ones will arise and their solutions will require the combined ingenuity, resourcefulnesss, and flexible thinking of every industrial arts teacher who believes industrial arts is an area of instruction worthy of a place in the scheme of American education. ◀

In the area of power mechanics, a discussion on **how to plan facilities** for a program in this subject — allied with a laboratory for electricity. . . .

planning the shop

A Electricity Supply Room
B Electricity Store Room
C Power Mechanics Supply Room
D Power Mechanics Store Room
E Assembly Bench
F Drill Press
G Grinder With Dust Collector
H Bench Lathe
J Electricity Area Tool Panel
K Ignition System Test Bench
L Box and Pan Brake
M Soldering Bench
N Electro-Plating Unit
O Battery Charging Unit
P Pneumatic Power Area
Q Portable Air Compressor (under bench)
R Wash-Sink and Fountain Unit
S Six-Station Electricity Bench
T Demonstration Two-Stroke Cycle Automotive Engine
U Demonstration Four-Stroke Cycle Automotive Engine
V Demonstration Diesel Engine
W Outboard Motor Jack
X Brake Horsepower Unit (arm type)
Y Brake Horsepower Unit (spring balance type)
Z Engine Running Station
AA Outboard Motor Running Tank
AB Fan Evacuated Exhaust System
AC Seating, Library, Planning Area
AD Mechanical Power Area
AE Hydraulic Power Area
AF Power Mechanics Area Tool Panel
AG Dis-assembly — Assembly Bench
AH Display Case (outside entry)
AJ Fan Evacuated Exhaust Hood



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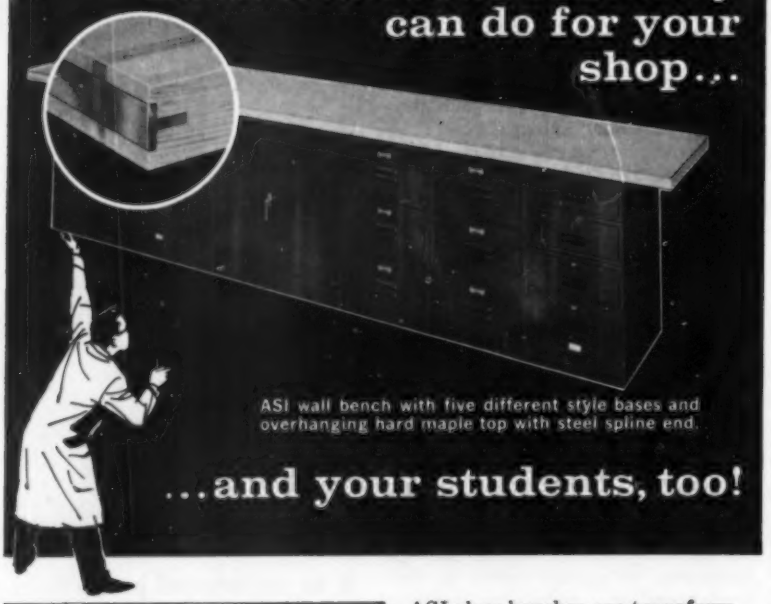

ASI wall bench with five different style bases and overhanging hard maple top with steel spline end.

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Locker base unit with wide doors, hard maple top and four vises.

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AVIATION SCHOOL

(Concluded from page 41)

systems. Accessory shop students study the removal and replacement of units and the theory and operation of all components of aircraft hydraulic systems.

In the 12th year, the student continues and further develops the skills and training habits formulated in the basic engine shops, including work on piston, turbo prop, and jet engines. The emphasis in this course is placed on the disassembly, assembly, and adjustment of engines and on "live" engine running and testing. All engine maintenance and inspection procedures are conducted in accordance with the F.A.A. requirements and manufacturers' recommendations. (Engine Runs: There are facilities which include a control room that permits operation of six reciprocating engines or two jet engines with indicating instrumentation. Acoustic treatment and water cooling for exhaust gases are included in this facility.)

The work in advanced maintenance consists of major and minor repairs on airplanes and engines including testing, removal, and replacement of units; painting; handling of airplanes; inspection and final assembly. Four complete airplanes plus a helicopter, all maintained in flyable condition, constitute the major instructional units here. In addition, there are always three or four additional planes undergoing repairs in the hangar.

The shop is organized along the lines of an airline hangar with instructors working as foremen. It incorporates a balcony which provides facilities for testing, inspecting, adjusting, and repairing electronic, hydraulic, and instrument equipment.

The hangar is located on the ground floor and opens onto an apron which is equipped with aircraft tie downs and fuel dispensing facilities.

Graduates Employed Throughout World

A follow-up of former students' records shows that thousands of graduates of the A.H.S. Mechanics Course are now employed with airlines and airplane and allied trades manufacturers throughout the world. Many graduates of the A.H.S. College Preparatory and Aviation Mechanics Courses enrolled in engineering courses in such colleges as Polytechnic Institute, Pratt Institute, and the New York State Institute. Their shop experiences give them a tremendous advantage in design and mechanical courses. Graduates of A.H.S. with certified mechanics ratings who enter the Armed Forces are usually given special advanced ratings and are placed in responsible assignments.

SOFT VINYL COVER GOGGLES

For heavy impact, 100% protection. Large, comfortable frame fits over any prescription glasses yet form-fits contours of face and nose. Acrylic *Impax* lens exceeds specifications for heavy impact. Exclusive lens-lock makes it easy to replace lenses; frames last indefinitely. Optional ventilation keeps goggles fog-free.

TUC-AWAY SAFETY SPECTACLES

Lightweight, comfortable protection against 90% of eye hazards. Exclusive *Retrax* temples — earpieces telescope in and out for perfect, comfortable fit. *Universal* nosepiece allows student to adjust frame to fit his face exactly. Optically correct, shatterproof Methacrylate lenses snap in and out for easy replacement. Interchangeable lenses have side and bottom protection for even greater flexibility and economy. Choice of 5 lens colors.

AS IMPORTANT AS THE SKILLS YOU TEACH!

COMFORTABLE WELDING GOGGLES

Safer because soft vinyl form-fits contours of face and nose, closing all gaps. *Comfortable* because of light weight and soft fit. *More flexible* because lenses are easy to change or replace, 6-inch width fits over largest prescription frames. Furnished with replaceable 50 mm round Federal Specification, welding filter lenses No. 3, 4, 5 or 6 shades . . . protected both sides by .040" thick hard plastic cover lenses.

AIR SPEC SAFETY SPECTACLES

All-plastic durable frame with acrylic lenses replaceable without use of tools. Total weight less than an ounce. Low-cost protection for visitors — fit over most prescription frames.

INEXPENSIVE ONE-PIECE ACETATE GOGGLES

Lowest cost protection for incidental use and for shop visitors. Quality one-piece acetate goggles, optically correct, with full, all around vision.

NEW! LOW COST FILTER RESPIRATOR MORE EFFICIENT, MORE COMFORTABLE

Respiratory protection is important, too — against pneumoconiosis-producing dusts, nuisance dusts, toxic dusts not significantly more toxic than lead, nuisance mists, fumes formed by vapor condensation. *Resp-R-Aid's* remarkable urethane foam filter is so soft and pliable its edges literally caress the natural contours of *any* face. *The entire mask is a filter.* More than 25 square inches of microporous urethane — up to 8 times the filtering area of most masks. Thousands of inter-connected cells trap foreign particles but let air pass freely. Yet *Resp-R-Aid* weighs hardly more than one ounce. *Resp-R-Aid* costs only $1.95. Order now, or ask for more information.

A healthy respect for eye hazards . . . an appreciation of safety standards . . . these are *essentials* you can instill in students in their formative years. Just as they'll never lose the skills you taught them, they'll observe safety rules and encourage others to, also. American industry will thank you for *two* jobs well done!

Watchemoket can help you. In our *Eye-Savers* line you'll find the right eye protective equipment for every hazard . . . at favorable prices that will help you at budget-time. What's more, Watchemoket safety products are designed to simplify fitting problems: because of exclusive features most models fit *any* face. And Watchemoket safety glasses are deliberately designed with comfort in mind.

Important, too — you can sterilize Watchemoket safety products and pass them on from class to class.

Send for catalog describing *full* line and special school price list. Watchemoket Optical Company, 232 West Exchange St., Providence 3, Rhode Island.

WATCHEMOKET

Eye and Respiratory Protective Equipment

WATCHEMOKET eye SAVERS

(For more information from advertisers, use the postcard on page 131)

BUILT-IN SAFETY

(Concluded from page 47)

Additional provision should be made in reference to fire fighting equipment (fire hose, extinguishers, respirators, and so forth); fire blankets; and first-aid kits for efficient operation in the event of disaster.[2]

The general details of planning and organization are not enough. Specific details must be considered for each machine and operation attempted in instruction. A thorough analysis will cover all aspects of each item included in the shop. It should be noted that the circular saw and jointer are the most hazardous machines, the wood area has the highest casualty rate (metal section second), the hands and fingers account for the most injuries, and unguarded equipment still contributes substantially to the accident toll.[3]

Criteria for Safety

In shop design and equipment analysis, certain specifics present themselves as primary in safety engineering. The following criteria may readily serve as a guide and checklist for hazard elimination:

Power Transmission. Are belts, chains, pulleys, drive shafts guarded with proper means provided for disengagement of the power source in accordance with the state code?

Machinery. Are all gears, sprockets, belts, chains, pulleys, clutches, spindles, arbor ends, and all dangerous revolving and/or reciprocating parts guarded?

Abrasive Wheels. Are adjustable hoods of substantial construction provided with flanges, are arbor ends protected, and goggles and/or glass shields provided for operator eye protection?

Saws. Are all saws equipped with guards; saws, lathes, and similar dust creating machines ventilated; and rip saws provided with a spreader or splitter to prevent stock from binding on saw?

Electric Wiring and Switches. Are all brackets, junction boxes, and receptacles securely fastened in place; drop cords should not be knotted or secured on nails; switches and mains provided with locks for protection and enclosed; all transformers, regulators protected from unauthorized persons; motor heads covered; all circuits grounded; and rubber mats provided in front of panel boards?

Stairs. Are hand rails provided on both sides; are they properly lighted?

Doors. Are all exit doors designed to open outward, or toward natural egress; two exits provided; with "see through" panels to avoid collisions?

Hand Tools. Are they maintained in good operating condition?

Eye Protection. Is suitable protection provided, and used when handling hot metal, welding, grinding, chipping, etc.?

Clothing. Is adequate safe clothing provided and worn?

Material Storage. Is it safely stacked in an orderly manner?

Fire Protection. Is a fire alarm provided; fire drills periodically held; and are fire extinguishers and hoses in good condition, properly coiled, and unobstructed?

Lighting. Is it adequate?

Sanitation. Is it adequate with drinking fountains, lavatories, waste cans, and toilets clean with ample sanitary supplies provided?

Housekeeping. Is it orderly, neat, and safe?

First-aid. Are adequate facilities provided; trained personnel available; all accidents reported.[4]

[2]Walker-Turner Division, Rockwell Mfg. Co., *School Shop Planning Manual* (Pittsburgh, Pa.: Rockwell Mfg. Co., 1952), p. 6.

[3]Stuart A. Anderson, "Danger Zones in Shop Safety," *Industrial Arts and Vocational Education*, Vol. 44 (Oct., 1955), p. 247.

[4]Industrial Commission of Ohio, Division of Safety and Hygiene, *Industrial Safety Service Manual, Covering Services, Accident Prevention and First-Aid Suggestions* (Columbus, Ohio: Industrial Commission of Ohio, Division of Safety and Hygiene, 1954), pp. 28-37.

TEACH THE

Basic Principles of Paper Cutting

with C & P CUTTERS

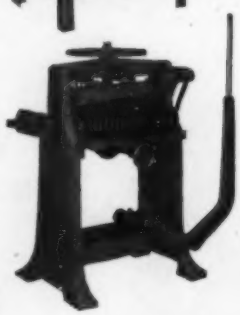
Every pupil in your graphic arts section needs (1) a thorough understanding of paper cutter operation and (2) a complete awareness of the importance of proper handling of paper cutting machinery.

Chandler & Price Paper Cutters are engineered to meet all the requirements for safe operation by students and have been standard equipment in schools for many years. If you have an out-dated or unsafe cutter in your school shop or are planning the purchase of a new one, your first consideration should be a school-approved C & P Cutter.

19½" and 23" Bench Model Lever Paper Cutters

Here is a small size lever paper cutter particularly suited to school shops where accurate cutting is required but where sizes of jobs do not require a larger cutter. A simple, two-handed safety lock removes practically all chance of injury to operator. Knife cannot fall accidentally nor cutting handle be pulled down until safety lock is held open by operator's left hand at the start of each cut.

Designed for mounting on bench or cabinet, this cutter may be purchased with or without the stand shown in the photograph.



Craftsman 26½" Lever Paper Cutter

The many exclusive features of this cutter make it the most popular cutter for school use. A two-handed safety lock prevents operation of the cutter until safety lock is held open by operator's left hand. The compound leverage action of the knife pull down makes cutting easier. A counter-weight balances the knife bar. A double-grip safety control which requires the use of both hands during the cutting cycle is available as extra equipment.

Full Hydraulic and Hand Clamp Hydraulic Paper Cutters—23," 26½" and 30½"

For a power cutter in any school shop C&P hydraulic cutters provide power cutting at minimum investment. Cutting operation is hydraulic. Clamping may be either hydraulic or by hand, depending upon the model selected. These cutters provide students with a knowledge of cutter construction and operation in fast, accurate cutting by the application of power. Cutter illustrated is the 30½" full-hydraulic with extension tables, which are not available on all hydraulic models. All C&P cutters are safety-approved for schools.

Complete descriptions of any of these cutters are available. See your C&P dealer or write us.

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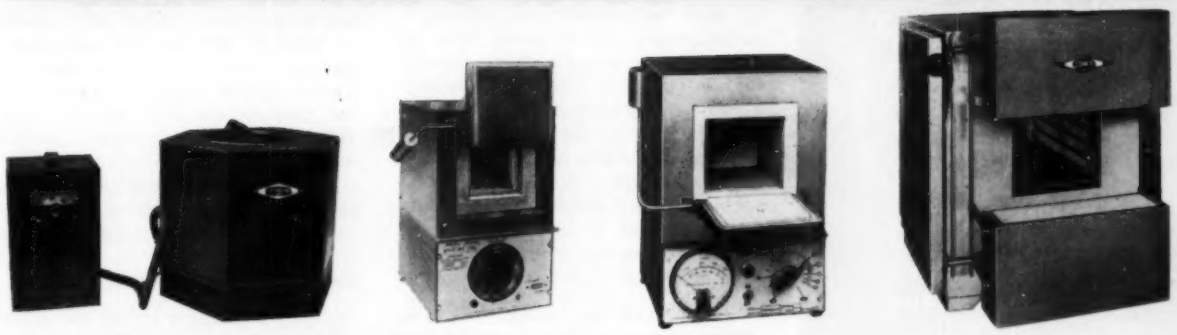
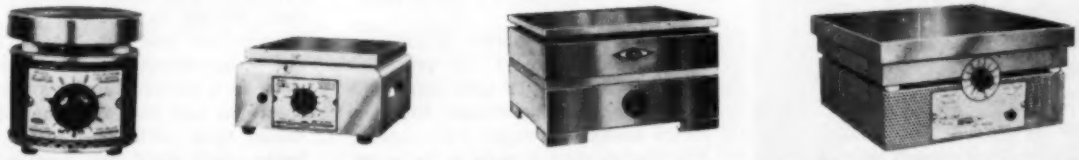


Bench-type furnaces in a wide selection of chamber sizes (from 4" x 3¾" x 4¼" to 10" x 9½" x 22") for experimentation, testing, and heat treating of tools, dies, parts. Widely used by schools and industry. Give *practical experience* with kinds of equipment used in commercial testing laboratories and plant production. Temperature limits from 1650° F. to 2300° F. continuous operation. Available with or without built-in controls. Prices start as low as $72.50.

Hot plates and stir plates featuring extremely close control of temperature. Various hot plate models in sizes ranging from 3½" diameter to 24" wide: Temperatures up to 700° F. Stainless-steel cases, cast-aluminum and cast-iron tops, scientifically ventilated. Prices start at $15.



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For accurate and convenient measurement of temperature and direct-current millivolts. Compact, easily carried. Four triple-scale ranges available.

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(For more information from advertisers, use the postcard on page 131)

managing the school shop

This 1961 edition of your March IA/VE school shop annual reviews several aspects toward more effective management of facilities for industrial education:

1. An overview of how organization in paper work — on projects and grades, inventory and ordering, demonstration, clean-up, locker assignment, etc. — will free you for more teaching opportunities and greater instructional achievement.

2. A consideration of management of industrial education equipment — with hints on efficient selection, financing and purchasing, installation and maintenance, replacement, etc.

3. A general approach to better methods in procuring and managing supplies.

4. A detailed program for handling supplies so that they are available at lowest cost for use by students when they are needed.

5. A discussion of how to control your inventory of equipment and supplies for efficient requisitioning.

6. A suggestion of a successful method of storing tools.

A Little Organization Saves a Lot of Time

JOHN H. ADAMS

The chances are certain that your classes average at least four additional students than they did last year. We're even willing to wager you have not only bigger classes but more class sections than you had several years ago. As the number of students increases, your school has become larger, the staff is larger, the whole system is more complex, and more and more paper work is constantly being required of you as an industrial arts teacher. You feel less like a teacher and more like an administrator — an inadequate one at that! Time is fast becoming more and more valuable as the number of students increases.

The end of the semester is probably the most hectic time of the year. But that isn't the time to start assembling all the miscellaneous receipts, lists, and record books to compile your reports. The time to start is early in the marking period. A simple set of forms takes little time to set up at the beginning, and the hours saved will prove invaluable not only at the deadline date, but all through the year.

We're not suggesting that you make your office look like the local headquarters for IBM, but we are suggesting that you take a hint from the end products. Getting organized is really simple. Your principal will think you're the smartest man in the world, living or dead, and you might even end up with a little time on your hands for a round on the golf course.

Some of the forms that we've found useful in our own job record keeping in teaching sheet metal courses at the college level are: (1) a project and grade record, (2) an inventory list, (3) an order and supply record, (4) a demonstration schedule, (5) a clean-up chart, and (6) a locker chart.

Project and Grade Records

Probably the most important single record that any instructor of industrial arts will keep, outside of his own mortgage payments, will be project and grade records. After experimenting with several types, we've found that the project record shown has some very distinct advantages.

First, the record for an entire class or section may be kept on one sheet of 8½ by 11 paper by using this type of form. Second, the forms may be stored through the years in manila folders and occupy relatively small amounts of space in a file compared with separate sheets for each student or the old green record book. ("Those infernal record books don't stack well, and we're always looking up last year's records in the book from two years ago; this year's marks in last year's books, and so. That always leads to more time lost and the administration seems to frown on our swearing in front of students.")

In some cases, the sheets may be supplemented with a 3 by 5 card if more detailed records of accomplishment on projects are needed.

Third, the averaging of grades at the end of the semester is simplified by the fact that all the records involved are located in a specific order on one sheet of paper for the entire class.

Mr. Adams is an instructor in cold metals, Ohio University, Athens.

Inventory and Ordering

Another of the major problems of the industrial arts teacher in record keeping is an accurate inventory and ordering procedure. The sheet pictured in which the standard supplies for the shop are listed in an organized manner have been found very helpful in accomplishing this purpose.

It is possible by using this sheet to have a student or lab assistant check the inventory and report what is needed. Some of our less organized colleagues call this type of thing "laziness," but we look upon it as sterling executive ability. The correct nomenclature and specification of each item is listed on the sheet so that the person checking need no longer thumb through a shelf full of catalogs to locate materials. Additional forms of this type may be made up with the material section left blank for the addition of little used or new materials that will at some later date be added to the regular inventory list.

Along with the inventory list, it will often be necessary for the instructor to keep a record of his quotations and orders in addition to the records normally kept by the administration. That secretary in the office is bound to be wrong once in a while! Not only is this a handy reference for the instructor, but is a good cross check on orders which seem to have a way of going astray — particularly when supplies are received between Christmas and New Year's or on July 4 when you're not around to check them. This form may be easily stapled to the inside of a manila folder and the instructor's copy of the order numbered and placed in the folder. And while we're getting organized, let's emphasize that paper clips are fine for temporary filing purposes, but one bang on your desk stapler fastens things much more securely and prevents papers from getting hooked under the wrong clip! Again, this method of record keeping is both time saving and space saving.

The Demonstration Schedule

The demonstration as a teaching technique is probably one of the most important single duties that the instructor performs. As we get older, we can't trust our memory to remember whether we did a particular demonstration last September, last month or last week. An accurate record of the demonstrations given is therefore a necessity. The demonstrations schedule pictured is a very simple way of maintaining this accurate record. Blank spaces are left at the top of the schedule in which the instructor may insert dates, section numbers and/or classes. Blank space should be left at the bottom of the schedule for the addition of new and pertinent up-to-the-minute demonstrations which will be added from time to time.

The Clean-Up

Another problem of the industrial arts teacher is the clean-up program. Most of us as instructors want to teach good work habits, safety practices, and maintenance of an orderly neat working situation. Therefore, the job of cleaning up the shop at the end of the period becomes a necessary chore. Of course, the pin-wheel boards with the flashing lights may achieve this goal; however, a very simple and adequate clean-up procedure is to supply a clean-up chart similar to the one pictured listing the sections or classes and the particular job involved. This chart

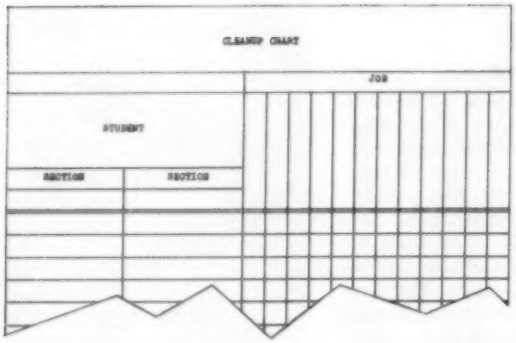
A seven point program designed to organize your shop management for more efficient instruction of our growing numbers of students. . . .

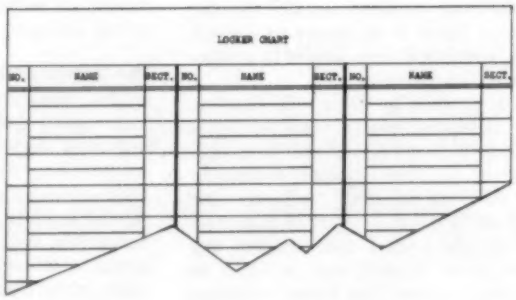
managing the shop

PROJECT AND GRADE RECORD

Section No. _____ Semester _____

Name	PROJECTS						TESTS			Project Average	Final S.M.	Final M.S.	Final Av.	Final Let.
	Sheet Metal	Bench Metal	Spinning											
	Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	No. 1	No. 2	Test Av.					





could be expanded to include more sections if desired. The students' names are listed at the left, jobs are listed on the right, and an "X" or check-mark is put in the box next to the student's name for the particular job the instructor wants the student to do.

A Locker Chart

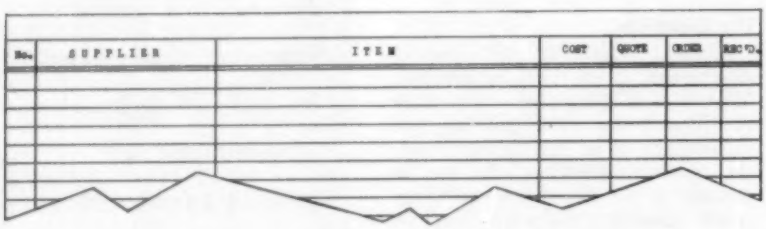
Also pictured is a sample of a locker chart which can be used to keep a record of the students' lockers for both the student and the instructor. This chart has been made up under the assumption that there will be two students assigned to each locker; however, any number could be assigned to a locker and the chart so arranged. The way things have been going lately, we'll probably end up with 36 students in each locker by the time we retire!

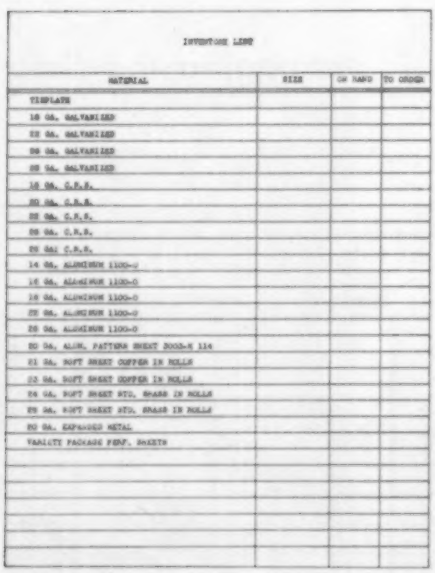
A quantity of these forms takes up only a minute amount of space. The hours of work that will be saved by their use will be well worth the small amount of time it takes to devise and set up a few forms to suit your particular needs at the start of the semester.

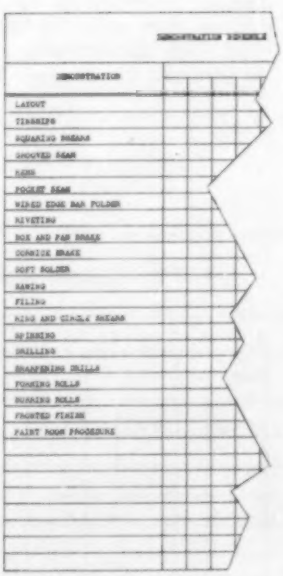
The forms can be made up, typed, and reproduced by spirit duplicator or mimeograph. In some cases, depending how much weight you throw around in the print shop, they could be a learning situation in the graphic arts program of your school.

One word of advice, though. Outside of showing your completed forms to the principal or the head of your department, we wouldn't recommend leaving them lying around where everyone else can see them. Very soon you'll have a big crowd hanging around your desk asking if you couldn't dream up a few good ideas for other departments. And that'll be just when you start saving all that time, too! ◀

ORDERING RECORD







Selection and Management of Industrial Arts Equipment

ROSS J. McARTHUR

▶ Suggestions for a sensible plan for selecting, purchasing, installing and maintaining equipment for a better program in our field. . . .

managing the shop

With the introduction of manual training into the secondary school curriculum the latter part of the nineteenth century, little thought was given to equipment needs as such. Since the logical person to teach the class was the custodian and his activities centered around the boiler room, this seemed the best place for the facilities and with a few additions his equipment met the felt need of the time.

As manual training evolved into our complex industrial arts program found today, the selection and management of the equipment necessary for this program has likewise assumed major proportions. The heavy line shafts and countershafts driven from one large motor have been junked and each machine now has its own power source.

The general objectives of the program have shifted from the emphasis on vocational education to that of general education although this unique phase of the program still exists to a large degree. This has influenced the type and quantity of equipment available as well as its installation and management. Along with these major changes in equipment and housing requirements there has developed the need for a highly trained instructor. Not only must he have an educational background equal to that of other teachers but he must have mechanical skill and knowledge to properly select, manage, and use the equipment available for individual activities of a space age.

Equipment Selection

With the rising costs of education and the long-range aspects involved in equipment selection and management, it is most important to bring into focus those factors upon which the most wise choice depends. According to a study made recently by the author[1] concerning this problem, a selected group of teacher educators throughout the United States indicated the two most important factors influencing equipment selection should be safety features and educational value. Other factors to be considered in their order of importance as opinioned by these specialists were quality, utilization, repair and replacement, size, servicing and upkeep, reliability and integrity of the vendor, initial cost, space requirement, design, installational requirements, standardization, operational costs, effect on other equipment, and make or brand name.

Too often not enough real thought and planning goes into equipment selection. The best approach seems to be a careful analysis of instructional procedure and course outline in determining both quantity and type of equipment needed. From this analysis should come a basic list in order of need to be procured over a given length of time depending upon the funds available and the immediate needs of the society served.

In practice, this procedure is not always used since many teachers base their requests either on the funds available or past year's activities. Another factor which has influenced equipment selection during the past few years has been availability of items through war surplus. These practices tend to give the administrator the impression that our program is not based on sound long-range objectives as the so-called subjects are thought to be.

When availability of funds becomes the prime basis of equipment selection, questionable practices usually result. Of these the most common and likely the most far reaching is sacrifice of quality and size. By this it is not meant that the top quality or the largest size is best for a given situation but too often small cheap items are procured, thus limiting the program for long periods of time. Sometimes it may be necessary to procure used equipment but this requires careful investigation.

In the past few years multi-purpose equipment has come on the market. This has tended to follow the home-workshop trend. The extent of use of this equipment in the school shop should be based on objectives of the program rather than funds available.

Financing and Purchasing

After a list of equipment needs has been prepared, a budget should be for-

Dr. McArthur is chairman and assistant professor, industrial education department, Brigham Young University, Provo, Utah.

[1]McArthur, Ross J., *"Selection and Management of Industrial Arts Equipment in the Secondary Schools of Missouri"* (Unpublished Doctor's dissertation, University of Missouri, Columbia, Mo., 1955).

mulated to meet this need. In the study made by the author[2] it was found that superintendents of industrial arts programs in Missouri and selected industrial arts teacher trainers agree that the extent of funds budgeted should be based primarily on the extent to which the equipment will be used, the time which is saved through its use, and the number of students who will use the equipment.

Most often, industial arts teachers are not given a fixed equipment budget although this is considered very desirable for new equipment. According to a study made by Graham[3] it is advisable to have available at least five per cent of the original cost of an item of equipment for maintenance and repair each year. Good practice indicates that any item of equipment for which the original expenditure can be justified should have no fixed budget for maintenance since it is wise to keep it in the best operating condition regardless of cost.

Superintendents and administrators expect industrial arts teachers to have on hand specific information concerning items requested. Specifically, teachers should know the approximate cost, have a sound reason for wanting the equipment, have exact specifications, know the problems and costs of installation, the number of students who will use the equipment, and have a planned schedule for adding future items.

Major equipment items usually should be procured through sealed bids with consideration of the best service in addition to the lowest bid. Some companies are not set up to provide any service beyond supplying the product hence may not be the lowest bidder in the long run. On specific name brand items of national repute there is no difference in product price, however, freight and trade-in items may vary considerably. Bidding is of greater importance when the teacher indicates the quality and features making any one of several brand names acceptable.

The best time of year to procure equipment from those supply houses which depend upon schools for their major business is during the first five months or the last three months of the calendar year. This will tend to stabilize employment within these companies and thus should eventually lead to reduced costs.

Some mention should be made at this time concerning shop made equipment since a great deal is constructed in the school shops. In the study made by the author[4] it was found that in the secondary schools of Missouri the practice most commonly followed was for the teacher and the students to work together during school hours without extra pay to the teacher. Good educational policy would indicate that this practice be used only when it can be worked into the objectives of the course involved. In the event the teacher makes the equipment outside of school hours extra pay should be allowed. In the event equipment is made in the school shop it should be done according to a well-executed plan and followed through to completion including finish.

Installation and Maintenance

When an item of equipment is procured it should be assembled and installed as soon as possible in order that any problems of missing or broken parts can be taken care of. New equipment unassembled and uninstalled is as useless as broken equipment. After installation, the instruction book and maintenance manual should be put in the equipment file provided for future reference. Also at this time all warranty cards should be mailed and an inventory record compiled.

Most equipment used in industrial arts shops requires no mounting to the floor although planning as to position relative to safety, electricity, and routing of work is nonetheless important. The best planning procedure for most applications is three-dimensional models on scale drawings. The alternative to this is a substitution of templates for the models.

In the event a piece of equipment does require mounting to the floor, two basic methods are usually employed. The best but relatively expensive method is to use commercial made mounting blocks which are cemented to the floor. These come in several sizes and reduce vibration and noise. If this is not necessary or advisable lag bolts will do the job.

One of the greatest indictments of our industrial arts program is the condition of the equipment found therein. We are generally judged by the state of repair and the condition of the equipment we control. Too many industrial arts shops show a need for much improvement here. Several factors should be mentioned concerning this problem. Probably the items which show the greatest need of attention are the work benches and drawing tables. These are also the largest items and the ones most used, which magnifies the problem.

A contributing factor in equipment condition is the use to which it is put by other than the industrial arts teacher or his students. If this use is controlled by the teacher entirely, as it should be, then responsibility may be placed for care and upkeep and interference with the instructional program will not result.

The solution to proper care and repair of equipment is adherence to a systematic program of preventive maintenance with time allocated to repair as necessary. Each item should be periodically inspected. In cases of major reconditioning it is highly advisable to use the services of commercial agencies or the school maintenance department if one is available.

If a program of periodic inspection, care, and repair is to be followed, time must be allocated in the daily schedule. This should amount to approximately four hours per week according to a study made in 1955.[5] Students should be used in this activity to a much greater extent than present practices seem to indicate.

Obsolescence and Replacement

Immediate attention should be given to those items now in our shops which are unsuitable, obsolete, or in poor condition. It would appear that there is need for greater emphasis on selection and maintenance activities in the training of teachers in our teacher training institutions.

Obsolescence of equipment has not been a major problem until recently, although many administrators and teachers have the wrong attitude regarding this problem. More thinking should be given to the question "Is the equipment doing the job effectively?" rather than "Can it still be used?" This is especially true when one follows a systematic maintenance schedule outlined above.

War surplus and rapid major changes in industrial production processes are creating special problems, especially in the metalworking field. Costs for replacement with modern equipment to interpret industry today is almost prohibitive.

In Summary

If an industrial arts teacher is to convince his administration and the public under which he works that money expended for his program is well spent, he must have a definite plan for selection and management of equipment, well executed, and based upon the best theory and practice available. This entails constant reading of current literature, continued educational advancement, open-minded discussions with equipment distributors, active affiliation with professional organizations, periodical attendance at local and national tool shows, and observance of current industrial practices. Then, with evidence of real understanding, he should make requests for and use of equipment based on the conditions obtaining.

[2] *Ibid.*, p. 76.
[3] Graham, Lyman M., *"An Analysis of the Power Woodworking Equipment in the High Schools of Texas"* (Unpublished Master's Thesis, North Texas State College, Denton, Tex., 1947), p. 68.
[4] McArthur, *op. cit.*, p. 104.
[5] *Ibid.*, p. 138.

Procuring and Managing Supplies

CHARLES BUNTEN

One of the never ending problems in the operation of school shops is the matter of procuring, financing, and managing supplies. In the early days when manual training, consisting largely of woodwork with required exercises or projects, was employed in the schools, it may not have been too difficult to secure instructional materials for the shop and to place them in the hands of students in an efficient manner. However, with the broad industrial education programs of today succeeding manual arts as a fundamental theory of education, the problems connected with supplies have assumed major proportions.

The management of these supplies represents a problem which takes up a large per cent of the teacher's time not otherwise used in teaching. If maximum use is to be made of the teacher's time for instructional purposes, then there is a need for accurate, businessslike methods in the administration of the necessary supplies.

Selection of Supplies

To silence some of the criticism leveled against our shop programs because of excessive supply costs due to waste, overbuying, or improper selection, as well as to assure a more adequate instructional program, careful consideration must be given to those factors most frequently involved in supply selection. The three major categories in this area which demand attention are: (1) type of supplies, (2) quality of supplies, and (3) quantity of supplies.

Analyzing these categories relative to supply selection is no simple matter because of the large range of items for which choices must be made. The variety of items needed for a single shop in woodwork for one year is amazing, and when supplies for print shops, sheet metal shops, electrical shops, machine shops, etc., are considered, some idea of the enormous number of different items for which judgment must be exercised in selection becomes apparent.

To make sound decisions concerning types of supply items to purchase, such as pine or walnut lumber, galvanized or black iron, etc., certain factors appear to be important. These factors are:

1. Grade level of student.
2. Type of industrial education course, or courses, offered.
3. Size and nature of projects to be constructed.
4. Whether there is an attempt to keep on hand new types of supplies for instructional and/or experimental purposes.
5. Budget allowance for the programs.

In determining the quality of industrial education supplies to be ordered, the teacher should be guided by the following factors:

1. Experience and suggestions of other shop teachers.
2. Attitude of the administration toward materials of a particular quality.
3. Budget allowance for the program.
4. Whether there is a desire to maintain certain higher quality materials for those who are willing and able to pay for them.
5. Analysis of recommendations from supply company representatives.

One of the first problems confronting the beginning teacher, and one of the first magnitude, is estimating or arriving at a logical quantity of supplies to implement his program of instruction. Any systematic approach to the problem must necessarily include a knowledge of existing supplies on hand. With this information available, the following factors should be considered in preparing the overall supply order for any industrial arts program:

1. Number of students taking course or courses.
2. Supplies used the previous year for any particular course or courses.
3. Budget allowance for industrial arts.
4. Size and nature of projects to be constructed.
5. Whether there is a desire to maintain surpluses of certain items.
6. Storage space and facilities for handling desired items.
7. Availability of surplus materials from outside sources at little or no cost to the school.

In school systems large enough to maintain a central storage facility where shop supplies can be withdrawn as needed, the factors mentioned concerning type, quality, and quantity supply selection can be used in establishing a standard supply list to be used by the purchasing agent.

Dr. Bunten is associate professor of industrial education, Southern Illinois University, Carbondale.

▶ **Better practices in supply management: "a problem which takes up a large per cent of the teacher's time not spent in teaching"...**

managing the shop

Purchase of Supplies

Where supplies are not secured from a central warehouse, and where the teacher is responsible for a yearly supply request, one of his best sources of information is the previous year's supply list, with estimated adjustments for increasing or decreasing enrollments. Another suggested method is to estimate the materials needed for one student in each course, multiply by the number of students in each course, then add the total of all courses. Still another method often used is to analyze typical projects for one student in each course, multiply by number of students in the course, and then add totals of all courses.

In establishing purchasing procedures for a school system, answers to the following questions should be sought: Who should purchase industrial arts supplies? From whom should supplies be purchased? What method of purchasing should be used? What time of the year should supplies be purchased?

Schools differ widely in their purchasing procedures. Large school systems require all purchases to be made through the purchasing department. Smaller systems authorize the head of the industrial education department to make all purchases for his department, while others require the superintendent or a committee of the school board to act as purchasing agent. In small, one-shop schools, the shop teacher usually makes all purchases for his shop with the approval of the principal or superintendent. In some few schools, the students are required to purchase all or part of their supplies from outside sources and bring them to the school shop. This method does provide some desirable purchasing experiences for the students, but is generally not recommended because of other problems arising from it.

Quantity purchasing is in nearly all cases more economical, and therefore recommended over small lot buying at frequent intervals. An exception to this general rule is the case where supply merchants are awarded exclusive contracts for annual or biennial purchases, with a provision that supplies be delivered only as needed by the school. Many school systems prefer that supplies be obtained locally when available and when prices are not too far out of line with other companies. This practice, although valuable because of public relations and convenience, is not recommended unless it results in a saving to the school system. The most economical method of purchasing supplies is by competitive bids, with satisfactory substitutes being accepted for items of equal quality.

In many one-shop schools, however, the teacher finds it necessary to use his discretion in determining the best purchasing method available, and because of small quantity orders, to accept list price on many of the items ordered. This would suggest the possibility of one-shop schools consolidating their industrial arts supply purchases, or perhaps using a co-operative or county-wide plan of supply purchasing. Almost any cost-saving plan followed would suggest that the bulk of supplies be ordered only once, or at most twice, during the year. To assure that supplies are available when needed, purchasing should be done in the spring or summer, or at least well in advance of the time the supplies are to be used.

Although quantity purchasing of supplies for the entire year is desirable, it is impossible to anticipate every item needed for so long a period of time. Consequently, some provision must be made for these contingencies. This is usually cared for by means of a small fund set aside and maintained by the principal, superintendent, department head, or by a petty cash fund controlled by the teacher. In all cases it is especially desirable to have a careful check on all receipts and expenditures involved in this fund.

Storing and Issuing Supplies

Few problems of school shop management are of more concern to shop teachers than the satisfactory storage and the efficient issuing of supplies to students. There are certain factors that determine the type of procedure used in any school system in storing and issuing supplies. These factors are: (1) the size of school, (2) size of classes, (3) number of classes, (4) physical facilities for storing and issuing supplies, (5) age of student, (6) types of shop courses, and (7) general fiscal and administrative procedures of the school system.

One of the most frequently used methods of storing supplies is in a special storeroom within the shop. This storeroom should be well equipped with shelves and cabinets so that all materials may be systematically arranged. This facilitates handling and record keeping, and enables students to learn the system quickly.

It goes without saying that student help should be utilized in issuing supplies to other students. Taking care of the stockroom and keeping materials records provide valuable experiences for students. This should in no way be construed as relieving the teacher of overall supply supervision, but only is a means of making maximum educational use of the industrial arts shop. Because of the enormous numbers of small, inexpensive items used by students such as nails, screws, etc., these items can be made more accessible by being stored in the shop proper and secured by students upon verbal request, or, as their needs demand, without the verbal approval of the teacher.

Major supply items should be issued by a designated supply clerk upon the receipt of a carefully prepared student requisition. This may be in the form of a separate materials requisition, or one of the many types of planning sheets in common use in school shops. Upon receipt of the materials request, the student making the request, or the supply clerk, takes this cost statement to a designated clerk where the amount is recorded or punched out on a purchased shop card, or to a school official authorized to receive money from students. In no case is it recommended that the supply clerk, record clerk, or teacher handle money paid by students. In small schools where this may be necessary, only the teacher should handle money, and then very careful accounting practices should be followed.

A plan used in many school shops to eliminate the need for teachers to handle money for supplies used by students is by the use of a materials card. This shop materials card, which has numbers placed around the outer edges that add up to the cost of the card, is purchased from the principal's office or from other authorized personnel. The amount of stock used is punched out on the card. When the card is used up, another one must be secured. Money not used is refunded when the card is properly sgined by the shop teacher.

Financing and Accounting for Supplies

Since it is understood that an industrial arts shop should be run on a business basis, provisions must be made for such things as preparing an annual budget for the money allotted to the shop, figuring the proportion of the supply cost to be borne by students, and collecting money from students for these supplies.

One of the first problems in financing supplies is to determine the portion of the total supply cost to be borne by the school. There are undoubtedly as many answers as there are schools; however, it is generally agreed that the school should not be expected to furnish more than 25 per cent of the cost. Generally, a larger proportion of the supply cost is borne by the school for the lower grades than for the upper grades. Some few school systems furnish all supplies, although this practice tends to deny students some of the educational values inherent in this type of program. For certain students who can-

(Concluded on page 111)

A Program for Handling Supplies

WILLIAM R. McNEIL

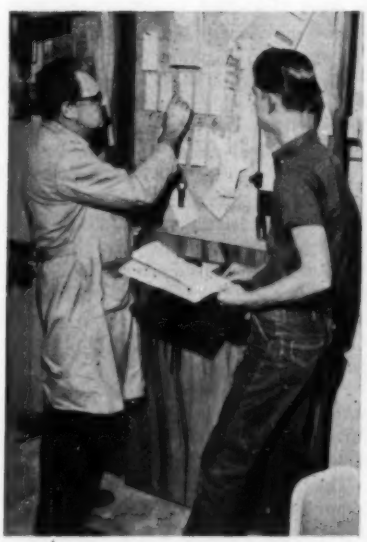
An organized program is believed to be the answer to many vexing problems that seem to be arising constantly in the method employed in handling supplies. The following program has been evolved over a period of several years and is still in a process of change as the situation warrants.

Mr. McNeil is a member of the industrial education staff of the Northeast High School in St. Petersburg, Fla.

Since a mutual understanding between students and the teacher as to what is required in the over-all shop program will eliminate many minor problems during the school year, a statement of "general procedures" should be developed. Among these procedures should be one for "materials and supplies." The procedures might include points similar to the following:

A very detailed, practical approach toward maximum efficiency in handling supplies...

managing the shop



Keys to efficient supply handling: (left) the back of the supply room doors holds the order sheets which are pieces of paper 2 by 5 in. When the order is filled, the name is crossed out. Orders are then placed on the bottom row and removed at the end of each six weeks period. They are retained until the end of the school year; (center) The rack for storing long boards, angle iron, steel rods, and tubing; (right) The shorts rack which are marked for lengths and identified by such abbreviations as "A" for ash, "M" for mahogany, "Ma" for maple, and "Ch" for cherry. etc.

PLANNING SHEET

Period _____ Work Station _____ Name _____

_____ _____ _____

Date started Date completed Name of Project

Bill of Materials

No.	T	W	L	Name of Part	Material	Unit cost	Total

Tools and Machines

Steps
1.
2.
3.
etc.

A suggested form for a project planning sheet to guide in sapply requisitioning — which can become a part of the student's notebook.

25 25 25 25 25 25

Student SAMPLE

MATERIALS TICKET
VALUE $2.00
INDUSTRIAL ARTS DEPT.
NORTHEAST HIGH SCHOOL

10 10 10 5 5 5 5

A sample materials ticket: core of the supply "bookkeeping" system which requires minutes at the start of each class and leaves the remainder of the time available to instruction.

1. Students are required to furnish their own materials and supplies.

2. Materials and supplies may be obtained at the school, *but may be purchased elsewhere.*

3. Current costs of materials and supplies will be published on the bulletin board.

4. All materials and supplies are to be paid for in advance.

5. All materials and supplies will be issued through shop tickets ($2).

These policies will vary, of course, with the general school's policies.

Ordering Supplies

The mechanics of ordering and dispensing supplies is rigidly adhered to in the following manner:

1. Each student must have completed plans and planning sheet before ordering supplies. These also become a part of his notebook. The plans need not be as exacting as a mechanical drawing but must contain a complete shape and size description. The planning sheet contains information pertaining to personal information, materials, tools, and the steps required for making the project.

2. Immediately following roll check, the student orders any supplies needed for the day's work or for a project. Small items such as sandpaper, steel wool, finishing supplies, and special tools not stored in the main shop room are dispensed the first part of each period. Orders for lumber or materials that cannot be obtained immediately are written on an "order sheet" which is kept on the back of the supply room door. Lumber orders are then filled during an off period or after school and placed in the main shop room with the purchasers name penciled on the material, to be picked up at the beginning of his next class.

Back Door "Hub"

The back of the supply room door is the hub of the "bookkeeping" system of the shop. Here the orders are written and the signature sheet, which the student signs and records the amount of money spent for shop tickets, is located. Shop tickets are sold at the beginning of the day. In order to avoid any unpleasant consequences, supplies are issued *only* to the student whose name is on the ticket. *No student* may use another student's shop ticket. To further avoid any possible problems, the shop ticket will have the student's name, class period number, the date purchased, and the teacher's signature shown on the face of the ticket.

The student retains possession of the ticket. When the value of the ticket has been spent, indicated by punching out the amount of the purchase, it is retained by the teacher for the remainder of the school year. This procedure seldom requires over three or four minutes at the beginning of each class period, leaving the remaining time for the teacher to attend to instruction.

The Supply Room

In order to facilitate the dispensing of supplies much thought has been given to storage methods that will make the process of getting to any material needed an easier task.

The lumber rack shown enables one to select any width board to be pulled out to the desired length and cut off with the portable power saw.

The shorts rack shown has proven to be a very convenient method of storing shorts and scraps left from the longer boards. Lumber under 36 in. in length is stored in this rack. To further facilitate finding material in this rack, each board has the length marked on the end. A china marking pencil, or chalk, is very useful for this purpose. The kind of wood, the thickness, and the width are easily noted. With the length marked, selection is rapid and convenient.

Savings can frequently be made by purchasing "shorts" from the lumber yard, these pieces are also stored in the rack.

The foregoing system may sound somewhat complicated but after using it for some years it has proven to be the easiest yet efficient plan the writer has found. Please bear in mind that with the exception of the large lumber orders, all of this usually takes place within the first five minutes of the class period.

Better Methods in Inventory Control

BERNIE KURLAND

▶ Ideas for the vital area of providing equipment and supplies (for "keeping store") for student use when they are needed. . . .

managing the shop

The industrial arts teacher, be he involved in woods, metals, electricity, power mechanics, graphics, pure drafting, or general shop is a storekeeper. Whether he is involved in a unit, general, or comprehensive general laboratory he is still dealing principally with students, processes, and materials. The three ingredients do not always mix kindly.

In addition to teaching skills, processes and general understandings (or developing desirable traits and workmanship), the industrial arts teacher must maintain his equipment and tools. He must also keep watch "on the store." Here-in lies a tale — easy to some; a pitfall to others; a chore to most of us when added onto the normal teaching tasks confronting us.

Do you ever ponder why $269 worth of Walnut didn't return $269? Or why you had to buy two dozen aluminum circles when only 20 show as being bought by your students? Are you going to have to spend "shop funds" to replace library books out of your shop library? What means have you to pay for bottled gas used for foundry or forge work? As you glance about your tool and stock room, and balance what greets your eye against what you know rests in your financial balance in the school office . . . are you comfy cozy? If sometime there has been the least discomfort . . . perhaps there are a few things you can do now, to make the task less sleep-arresting.

Sharing Financial Responsibility

One thing to ascertain, early in the game, is that pupils bear the fair share of financial responsibility. Do most, if not all "pay their way," or are an unhealthy number of your boys riding the gravy train? Most of us see the need for teaching honesty, integrity, responsibility, and respect. The industrial arts laboratory can, and has proved one of the most effective places in the school to do just that! It rests with the instructor, his "system" and personality, to place a program before youth, and *See that it works!*

Some of our schools (to get to the issue) "sell" materials tickets in one, two, or five dollar denominations. From this fund, the students draw whatever they use in the way of shop materials. I merely use mine as a receipt for the student to keep, and keep a 4 by 6 card to record how much he has on deposit (and daily) how much material he uses. When he approaches his deposit limit, he is told to bring in more for another ticket and bring his account up to date. These tickets are numbered, incidentally, and help keep accounts straight with the office. The 4 by 6 can tell of past shop experience, hobbies, and career inclinations. Other teachers have a more extensive body of knowledge printed on the card. I like to keep it simple.

How are the materials paid for? As a pupil draws supplies, finishing paper, screws, metals or wood he makes out a "bill of materials" and turns it in to the toolroom clerk (after instructor's approval) then the instructor periodically (should be daily) transfers this information to the card . . . the old bills can be thrown away, or kept as a record of the pupils' own activity. Frequent checks with the cards soon indicate who might have "forgotten" to pay for that piece of ash being laminated into a pair of water skis.

Financial Accounting

Properly motivated pupils want every project graded. When this is done, check to see if the project going home is not only properly made and finished, but, equally important, has it been properly accounted for financially? This is as important in character building as any other feature. Some of our folks wait until the whole project is completed, and then, with the student add up all the costs. Personally, I like the idea of a properly made out plan sheet estimating the cost first, completing the project (on a-pay-as-you-go-basis), and then comparing the two — the student's estimate and the final true cost. This helps keep the boys honest, aids their mathematics and properly reviews stu-

(Concluded on page 112)

Mr. Kurland is a general shop instructor, Miami Edison Junior High School in Miami, Fla.

▶ Consider wall cabinets for —

Tool Storage

ROBERT B. SONDERMAN

Over the years much has been written concerning tool storage and tool check-out systems utilized in industrial arts shops. Some schools still maintain tool cribs while many others have changed to the more popular open tool panels. Regardless of the type of tool storage utilized, the advocates of the various types will boast of the effectiveness of the type employed.

It has become apparent that objectives are approximately the same, yet different methods are used to achieve them. The following is a partial list of the objectives concerning tool storage which seems appropriate:

1. Tools stored so they can be secured quickly and with a minimum of confusion.
2. Tools stored near the place where they are needed.
3. Tools displayed attractively yet conveniently.
4. Tools stored so shortages can promptly be ascertained.
5. Tools stored in such a manner as to give the pupils an appreciation for good tools and the care taken in storing them.
6. Tools stored in such a manner as to make possible locking them when and if necessary.

At Eastern Illinois University, we have developed tool storage wall cabinets which attractively display the tools like the open tool panel style, yet provide for locking if necessary.

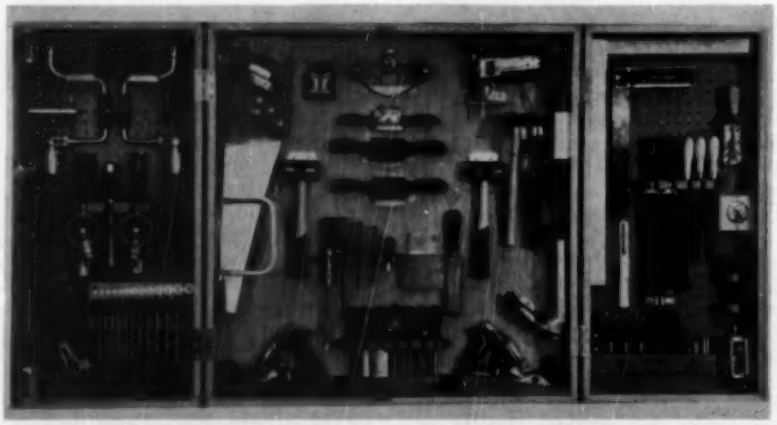
The two cabinets displayed are used in a general woodwork laboratory at Eastern Illinois University. The laboratory is equipped with four-station work benches with the individual type tools stored at one bench. One primary advantage of storing the tools at the bench is to eliminate as much as possible the unnecessary movement of the pupils from place to place in the laboratory. Most experienced teachers have found that many control problems are a direct result of aimless tours of the laboratory under the pretense of seeking tools. Although we do not advocate assigning the pupil to a work station and chaining him to it, we still use any device available to minimize distractions and movement in the room.

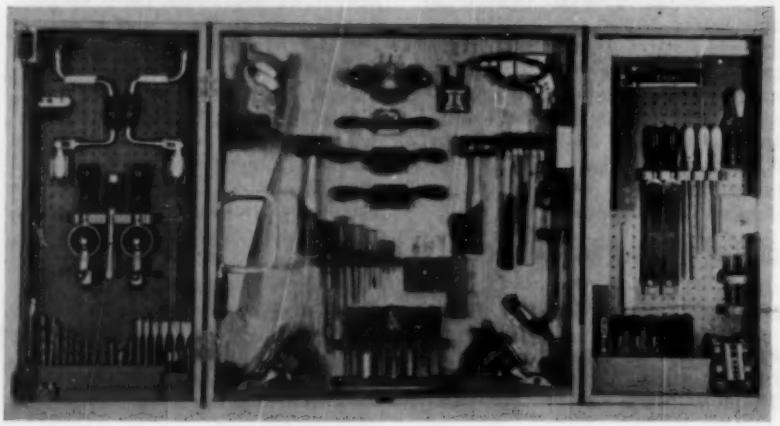
Some teachers would find fault with individual style tool storage cabinets used in any connection because it necessitates more time in checking to see that all tools are returned to the proper place. But this is a small price to pay for decreasing the frequency of disciplinary situations. A teacher could employ the pupil personnel organization to check on tools, which would free the teacher for other duties.

A type of individual tool storage cabinet has been fastened at each end of a four-station woodwork bench. The selection of tools included, as well as the positioning of the tools in the cabinet, can be varied to meet the needs of individual situations.

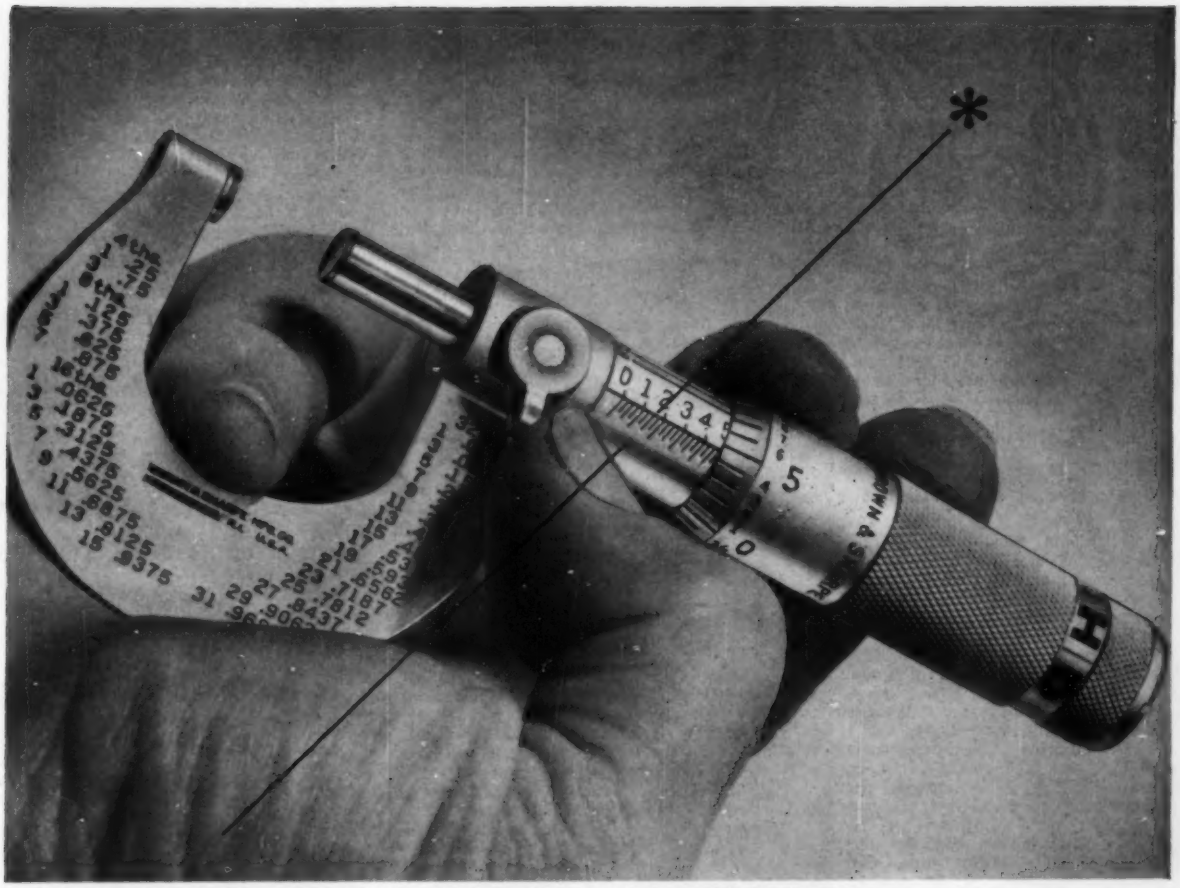
The larger type general tool cabinet which can be hung on the wall or used in conjunction with a counter type work area can be effectively located so as to minimize pupil movement. These cabinets could be used to house tools for metal work, electricity, drafting, or any other area of manipulative endeavor. The wall cabinets shown are equipped with the dead bolt type lock which limits the possibility of accidental locking or opening by normal tampering.

Generally, the idea of two types of tool storage has been discussed here. First, the individual tool concept with the tools which are used most frequently and stored at the work station, and secondly, the general tool concept with the tools which are less frequently used but very necessary and should be stored relatively close to the area where they will be used. This effort did not embrace the storage of such hand tools as might be necessary for the proper operation of such equipment as lathes and the like. It would seem obvious, however, that the tool storage methods discussed could be varied to serve other situations. ◀





Dr. Sonderman is an associate professor, department of industrial arts, Eastern Illinois University, Charleston.



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new books

Welding Skills and Practices

By J. W. Giachino, William Weeks, and Elmer Brune. Cloth, 279 pp., 6¼ by 9¼ in., illus., $4.95. American Technical Society, Chicago, Ill.

This book provides practical instruction in the development of specific welding skills and presents a general overview of the various welding processes. It is divided into two parts — oxyacetylene welding and electric arc welding including inert-gas-shielded arc welding. Each section covers current welding operations, with numerous illustrations added to provide valuable help in more fully understanding the text material.

This text gives full and complete information on all types of welding. Beginners and veterans alike will profit from the explanations of manipulative skills. It is organized so that students can be divided into several groups, making it possible for them to pursue the most logical sequence of instructional experiences.

The last chapter is devoted to welding symbols. Some of the more common symbols for arc and oxyacetylene welding are reproduced by courtesy of the American Welding Society. An index is also included.

Electric Circuits and Machines

By Eugene C. Lister. Cloth, 397 pp., 6⅜ by 9¼ in., illus., $5.50. McGraw-Hill Book Co., New York 36, N. Y.

This third edition gives a concise presentation of the fundamentals of direct and alternating current circuits and machinery. Information on all major types of electric machinery is included; basic principles of electricity are presented with a minimum of detailed mathematical analyses.

The text includes material on circuit protective equipment. Also notable is the lucid treatment of a.c. machines; the effective use of industrial symbols; the many illustrations of modern electrical equipment; and the well-chosen questions and problems.

The book is intended for technical schools and for survey courses for non-electrical engineers. It is excellent for home study by electricians and electrical maintenance men because of the straightforward treatment of the subjects covered.

Minor revisions have been made to bring the book up to date. Much rewriting was done in many of the chapters, some new material has been annexed, illustrative materials have been updated, and new problems and review questions have been added.

Radio Servicing — Theory and Practice — Third Edition

By Abraham Marcus. Cloth, 649 pp., 6¼ by 9¼ in., illus., $6. Prentice-Hall, Inc., Englewood Cliffs, N. J.

The purpose of this book is to teach the theory of the radio receiver and how to service it.

The work is dealt within 16 chapters covering: electrical and radio theory, components and parts, the electron tube, the electron tube as a rectifier, the electron tube as a detector, the electron tube as an amplifier, practical amplifiers, the electron tube as an oscillator, special tubes used in radio, control circuits, power supplies, radio receivers, instruments used for servicing, servicing procedures and techniques, and a final chapter on repair, replacement, and realignment.

Appendix A consists of a glossary of electrical terms, symbols, units, and abbreviations, Appendix B is a glossary of electrical formulas, and Appendix C presents a table of pilot lamps most commonly used in radio receivers. The book also has an index. To help the reader understand the many electrical diagrams in the book, there is a list of graphic symbols on the front and back end papers.

Machine Tool Operation, Part III: Shaper, Planer, Grinders

By Aaron Axelrod and James Anderson. Paper, 123 pp., 8½ by 11 in., illus., $2. T. F. H. Publications, Inc., Jersey City 2, N. J.

This workbook is intended for use with *Machine Tool Operation*, Part II. It is a book of achievement tests, to be assigned after the textual material has been covered sufficiently in class.

Every test calls for at least twenty responses; some have more. An answer book or key for instructors has been prepared.

This new edition stresses safety, in conformance with the trend that many schools have adopted requiring that a safety test be given before a student operates the machine for the first time. A safety test on each basic machine tool is included.

Machine Tool Operation, Part IV: The Milling Machine

By Aaron Axelrod and James Anderson. Paper, 122 pp., 8½ by 11 in., illus., $2. T. F. H. Publications, Jersey City 2, N. J.

This workbook is also intended for use with Part II. It follows the same procedure

(Continued on page 68)

books on electricity-electronics

Industrial Electronics

By Paul B. Zbar. Paper, 201 pp., 8¼ by 11 in., illus., $5. McGraw-Hill Book Co., Inc., New York 36, N. Y.

This is a laboratory manual for electronics technicians. It is also the fifth book completed during the past six years in the Basic Electronics Series, and has as its purpose the upgrading of instruction in electronics technology. Prepared under the auspices of the New York Trade School and the Electronic Industries Association, it was developed in response to the requests of educators for assistance in formulating a curriculum and developing a laboratory program in industrial electronics. It is intended to provide standards in a field which is not well defined, and is an effort to modernize, improve the level, and extend the scope of instruction in the training of industrial electronics technicians. The content of the book is comprised of "jobs" numbering 39, and each job is preceded by a discussion of the objectives, theory, and principles underlying the work in the experiment. Basic principles are emphasized. A step-by-step procedure is followed, and sample tables are provided for the student to follow in recording his data and results. The conclusions which the student has reached are brought out by a series of pertinent questions at the end of each job.

Electricity and Electronics — Basic

By William B. Steinberg and Walter B. Ford. Cloth, 262 pp., 6¼ by 9¼ in., illus., American Technical Society, Chicago, Ill.

The purpose of this book is to make it possible for the student to become familiar quickly and easily with the fundamentals of electricity and electronics. The contents present a direct and simple description; each step is clearly illustrated by photographs and drawings. In progressing through the book the student is introduced to the convenient symbols used by engineers and technicians in all fields to represent electrical and electronic equipment on diagrams. Each unit ends with a group of review questions. This book paves the way to greater knowledge of the vocational opportunities available in this area in ever increasing varieties.

Classification of Electron Tubes

By J. Haantjes and H. Carter. Paper, 96 pp., 8⅛ by 11½ in., illus., $3.50. The Macmillan Co., New York, N. Y.

Since the field of applied electronics is so wide, and the variety of electron tubes so great, the authors of this book and the accompanying chart have endeavored to provide some guidance in this direction.

Meant both for the professional electronic engineer, and for workers in other branches of science and industry, the book's thirteen chapters deal with basic principles, freeing electrons, methods of classifying electron tubes, high-vacuum thermionic tubes (1) high-vacuum thermionic tubes, (2) X-ray tubes, high vacuum thermionic tubes (1) — high-vacuum thermionic tubes (2) — X-ray tubes, high vacuum thermionic tubes (3) — Cathode ray tubes, high-vacuum photo-electric devices, gas-filled thermionic tubes, cold-cathode tubes, gas-filled photo-electric cells, pool cathode tubes, applications of electron tubes, and a glossary of odes and trons.

For the benefit of the student and the lay reader, a brief and simple account of the principal phenomena upon which the operation of electron tubes is based is given in the early part of the book.

1961 Television Servicing Information

By M. N. Beitman. Paper, 192 pp., 8⅜ by 10¾ in., illus., $3. Supreme Publications, Highland Park, Ill.

This is the latest edition of Supreme's television servicing manuals. It presents the most-often-needed servicing information on the 1961 name brand TV sets, along with numerous illustrations and diagrams of the various models and chassis.

Introduction to Electronics

By Robert J. Hughes and Peter Pipe. Cloth, 421 pp., $3.95. Doubleday & Co., Inc., New York 22, N. Y.

This is a self-teaching text, which requires the student to master each lesson effectively before he can proceed on to the next.

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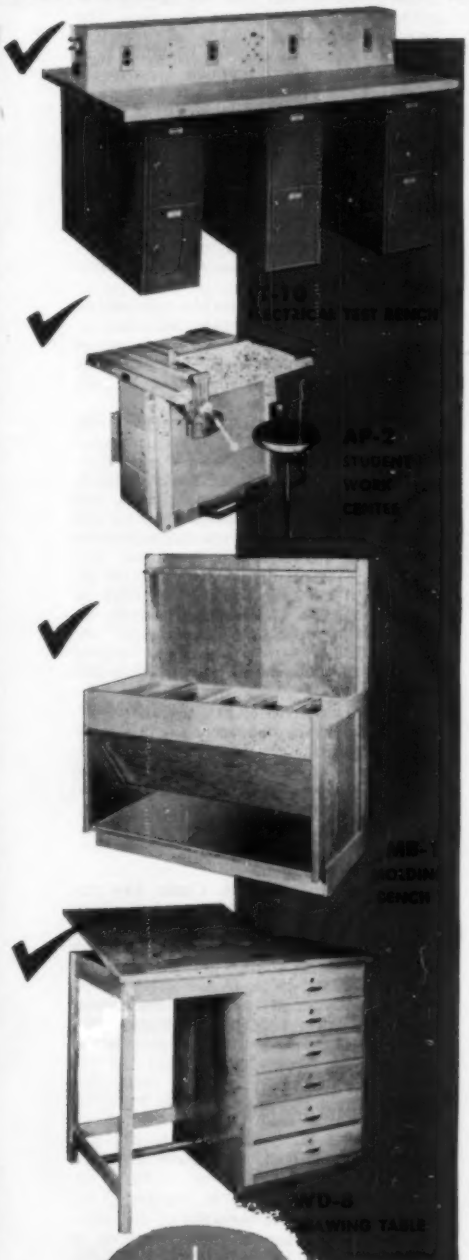

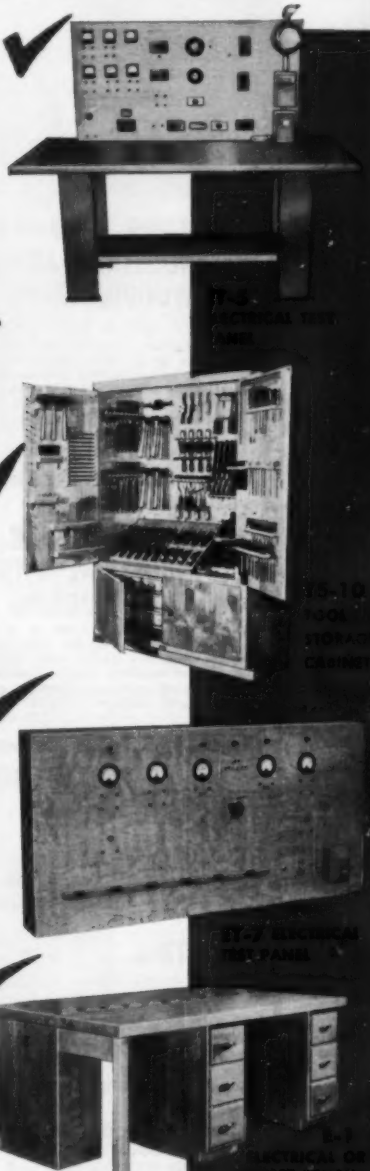

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NEW BOOKS

(Continued from page 66)

as Part III, including a strong accent on safety.

Metal Spinning Techniques and Projects

By Harold V. Johnson. Cloth, 130 pp., 6¼ by 9⅛ in., illus., $3.50. The Bruce Publishing Company, 400 N. Broadway, Milwaukee 1, Wis.

In this book the author presents useful guides to teachers, students, and homecraftsmen on the art of metal spinning. This book was written to meet the needs of those who have had no training in metal spinning processes, and at the same time, it will be of assistance to those craftsmen who already have been doing some work in this area of metalcraft.

The first thirteen chapters deal with the history of metal spinning, its value as a trade, safety factors, planning and designing projects, the tools, metals, and lubricants commonly used, in addition to soldering techniques and finishing processes.

The remainder of the book is devoted to the making of specific projects. Each article described is accompanied by a list of materials and supplies needed, and the procedure for making the article, in addition to a drawing, and a photograph of the finished project.

Designing and Making Hand-Wrought Jewelry

By Joseph F. Shoenfelt. Cloth, 172 pp., $4.95. McGraw-Hill Book Co., Inc., New York 36, N. Y.

This book is addressed to student and amateur craftsmen and embraces a broad field of processes in the making and finishing of jewelry in silver, gold, and other precious metals. The approach is that of outlining specific sequences of operations in handling wire, sheet metals, and solid metals; applying decorative elements, setting gem stones, and finishing various metals. Excellent chapters explain combinations of techniques and using such materials as bone, rare woods, etc., in combination with metals. Originality in design and individuality in the character of jewelry pieces are emphasized. A useful appendix helps the workers to find the causes of failures, and how to correct them. Lists of tools and equipment and sources of supply are given.

Slide Rule in a Nutshell

By S. Schirmacher. Paper, 8 pp., 5½ by 8½ in., 25 cents. Published by Anozira Agency, 1725 Farmer Ave., Tempe, Ariz.

This "do-it-yourself" booklet gives the learner eleven lessons to aid him in locating the numbers on the slide rule and to master the reading of this apparatus.

Engineering Mechanics

By Irving H. Shames. Cloth, 656 pp., $9.75. Prentice-Hall, Inc., Englewood Cliffs, N. J.

This introductory book is a vector treatment of the principles and widely used applications of mechanics in modern engineering. The work is comprehensive and the applications are taken from widely met engineering situations in public works and industry.

Mechanics

By John W. Breneman. Cloth, 262 pp., 6¼ by 9¼ in., illus., $5.50. McGraw-Hill Book Co., Inc., New York, N. Y.

The first two editions have been widely used in junior colleges, technical institutes, and industrial training programs. This third edition has been rewritten to comply with engineering notation. It is adapted for students at the engineering aide level but retains all that has been helpful in apprentice programs.

The book stresses the fundamentals of mechanics, both statics and dynamics. The revision has biaxial and triaxial force systems and particle dynamics, including normal acceleration and impulse momentum.

The third edition contains more than twice as many problems than either of the first two and has many complete illustrative examples.

Applied Engineering Mechanics

By Alfred Jensen and Harry H. Chemoweth. Cloth, 409 pp., 6¼ by 9¼ in., illus., $6.50. McGraw-Hill Book Co., Inc., New York 36, N. Y.

This second edition provides a simplified approach to engineering mechanics that requires as background only high school algebra and trigonometry. The thorough revision includes new material on both Statics and Dynamics.

In Statics, there is a new article on belt friction and a completely new chapter entitled "Miscellaneous Problems" that considers the forces produced by hydrostatic loads, the stability of retaining walls, and the forces acting in suspension cables and arches. In Dynamics, the treatment of noncentroidal rotation is expanded; two alternate concepts of plane motion are introduced; and there is new material on the conservation of linear momentum, direct central impact, and the angular impulse-momentum relationships as applied to practical problems of both rotation and plane motion.

Answers are given to half the 1100 problems included in the second edition. Of these problems, 325 are completely new, many contain new data, and alternate methods of solution have been added to several types of problems.

Basic Graphical Kinematics

By Harold B. Kepler. Cloth, 314 pp., $6. McGraw-Hill Book Co., Inc., New York 36, N. Y.

This book supplies a complete treatment of kinematics from the graphic approach and is intended to supplement the analytical methods usually taught in the regular mechanics courses. Many mechanisms can be more easily analyzed by combining the graphic with the analytic method.

Engineering Dynamics

By Irving H. Shames. Cloth, 631 pp., $6.75. Prentice-Hall, Inc., New York 11, N. Y.

This book provides a comprehensive treatment of the mathematics of dynamics. It suggests the use of vector methods in modern mechanics, and provides a background for advanced students in space mechanics. It is in reality a geometry of motion.

Energies of the Universe

By Eugene Fritz. Cloth, 124 pp., 5⅝ by 8⅝ in., illus., $4.75. Philosophical Library, New York, N. Y.

This is a popularized account of natural phenomena as understood by modern

science. The author presents facts and figures to support the view that the education of today's scientists is in many instances based on misconceptions, and is now obsolete.

A Structure of Science

By Joseph H. Simons. Cloth, 269 pp., 5¾ by 8¼ in., $4.75. Philosophical Library, New York, N. Y.

The author's primary objective in writing this book was to resolve some of the conflicting consequences of the extrapolation of scientific facts and theories to the universe itself.

The book is divided into three parts. In Part I, Science and Its Devotees, an attempt is made to show what science is, what it is not and how it fits into the framework of human knowledge and experience. It also discusses scientists, who they are, what they do, and how they think. Part II, The Concept of Science, deals with the basic intuitive concepts of science and shows their mutual relationships, their relationships to the useful abstractions of space and time and to common experience. In Part III, A Tidy Universe, an effort is made to resolve some of the apparently conflicting consequences of certain scientific beliefs.

The Chemical Industry Facts Book, 1960–61 Teacher's Guide

Prepared by Dr. Donald G. Decker and Dr. John A. Beel. Paper, 163 pp., illus., $1.25. Manufacturing Chemists' Association, Inc., Washington 9, D. C.

A fourth edition, this book gives the latest information on what the industry is, what it does, and touches on the roles its products play in individual daily life as well as in industries of our nation.

Chapter highlights include the chemical industry in the United States, how the chemical industry operates, chemicals in everyday life, and chemicals in the service of man.

Modern Trigonometry

By Dick Wick Hall and Louis O. Kattsoff. Cloth, 236 pp., 6 by 9¼ in., illus., $4.95. John Wiley & Sons, Inc., New York 16, N. Y.

Both elementary and modern, and usable at both senior high school and college levels, this book is analytic in its approach and emphasizes the ability to reason about the trigonometric functions. Consisting of 15 chapters, the material presented covers the Pythagorean theorem and its applications; co-ordinate systems; angles and their measurements; the trigonometric functions; finding the value of the trigonometric functions; linear interpolation; logarithms; the right triangle — applications; trigonometric identities and equations; the law of sines — the area of a triangle; the law of Cosines — Heron's formula; and trigonometric functions of sums and differences of angles — double-angle and half-angle formulas; and concludes with a chapter on complex numbers. There is also an index.

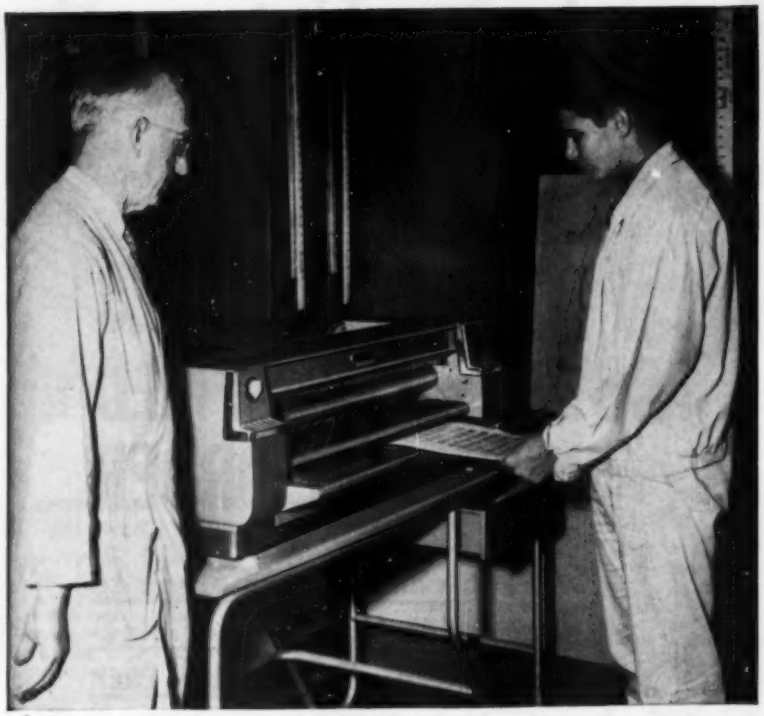
Classical Mathematics

By Joseph E. Hoffmann. Cloth, 159 pp., $4.75. Philosophical Library, New York 16, N. Y.

This book gives a detailed history of mathematics. The time span covered is the seventeenth and eighteenth centuries — the periods known as the High and Late Baroque and the Age of Enlightenment.

The author relates the development of mathematics to the growth of intellectual

(Continued on page 72)



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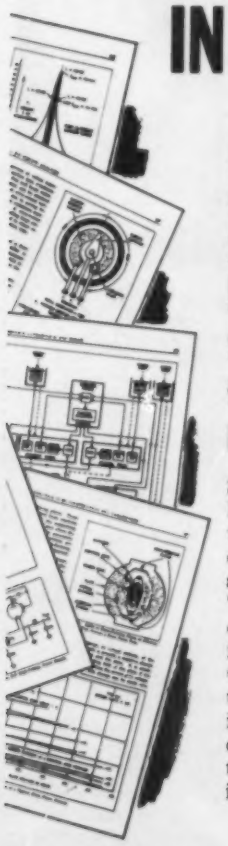

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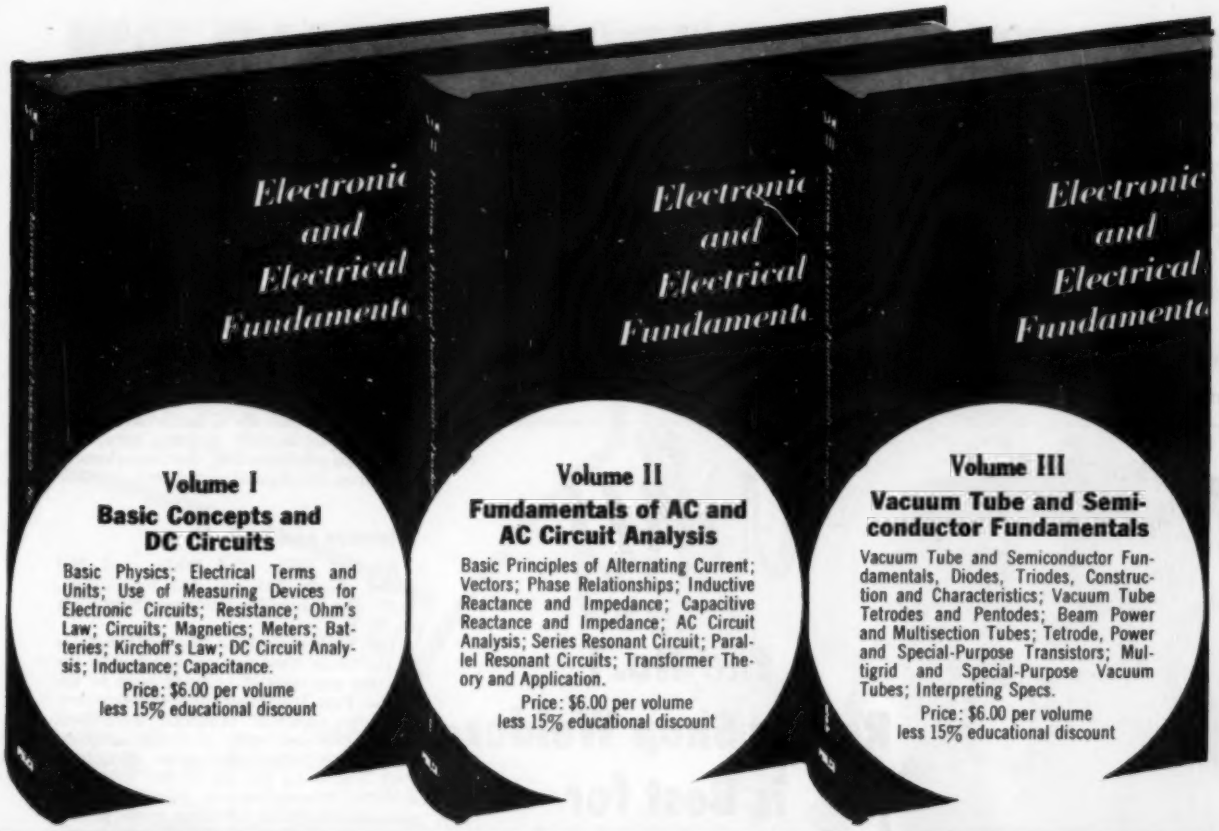
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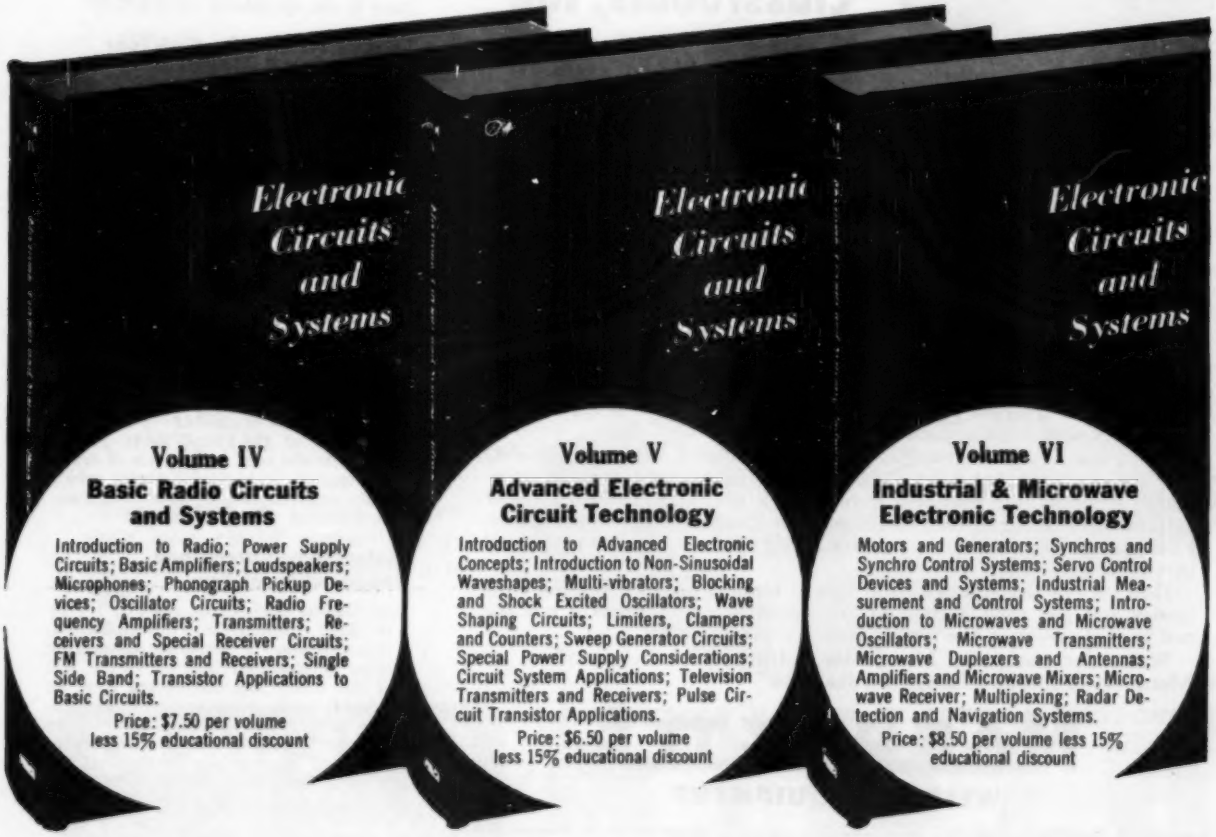

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NEW BOOKS

(Continued from page 69)

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Included in the chapters are discussions on Descartes, first achievements in the infinitesimal domain, discovery of the power series method, discovery of the calculus, controversies over the calculus, other mathematical advances, and infinitesimal mathematics in Japan.

Basic Mathematics for Electronics

By Nelson M. Cooke. Cloth, 679 pp., 6¼ by 9¼ in., illus., $7.50. McGraw-Hill Book Co., New York 36, N. Y.

This is the second edition of the book originally entitled *Mathematics for Electricians and Radiomen*. The purpose of the new edition is the same as the first: to provide students of electronics and electrical subjects with a sound background in basic mathematics. Wherever possible, mathematical concepts and processes are related directly to electrical and electronic applications, and some chapters equipped school shop. It would be interesting to know how many of the items can be made by a school industrial arts class and help achieve the objectives of industrial arts work. The book includes complete drawings, bills of materials, and deal only with applications.

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The book includes a vast number of illustrations.

Eliminating Man-Made Interference

By Jack Darr. Paper, 160 pp., 5½ by 8½ in., illus., $2.95. Catalog No. MMD-1. Howard W. Sams & Co., Inc., Indianapolis, Ind.

This book on noise and interference problems confronting the service technician, includes twelve chapters which cover the field of man-made interference — what it is, how it is transmitted, how it originates, how to track it to a source, and how to eliminate or minimize its effects in home radios and TV's, audio amplifiers, two-way mobile-radio systems, auto, aircraft, and marine radios, electromechanical apparatus, geophysical equipment, and the like.

Television and Radio News

By Bob Siller, Ted White, and Hal Terkel. Cloth, 227 pp., 5¾ by 8½ in., $5.95. The Macmillan Company, New York 11, N. Y.

This book comprising two parts explains to the reader how professionals handle the exacting processes of bringing news to the public. Part I embraces five chapters covering the topics of broadcast journalism, radio news and radio newscast, scripting radio news and radio news operations. Part Two — An Eye for News: Television includes information on television news, newsfilm, scripting television news, getting the story on film, television news operations, and a career in broadcast journalism. There is also an index.

General Drafting for First-Year Course for High Schools

Paper, 83 pp., illus. New York City board of education, Brooklyn 1, N. Y.

This book is a part of the industrial arts program in the academic high schools. Its purpose is to help students to learn to communicate ideas graphically by means of lines, shapes, symbols, and other conventional indications; to develop ability in freehand drafting; to develop proficiency in the use of the basic tools of the draftsman; to learn the underlying theory and practice of mechanical drafting; to learn about industrial materials and the processes of their production as used in the world; to learn about design as applied to production, through the solving of problems; to learn about the various ways in which drawings may be duplicated.

The plan of the course is to present problems to the pupil in the form of drawings, together with related sheets which provide some instruction, data, and questions based on these problems.

Photography: Careers and Opportunities for You

By Charles Abel. Cloth, 104 pp., 5⅛ by 8 in., $2.95. Chilton Co., Philadelphia, Pa.

Anyone who is seriously considering making photography his life work will find this timely and fact-packed book an invaluable guide to a successful and exciting career. The author endeavors to show the reader the various divisions of professional photography and covers his subject in two main parts: being your own boss; and working for others; each

(Continued on page 74)

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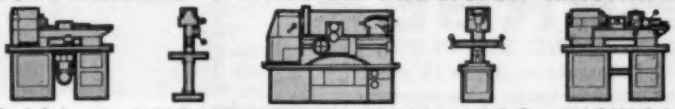

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(Continued from page 72)

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The Art and Craft of Screen Process Printing

By Albert Kosloff. Cloth, 170 pp., 6¼ by 9½ in., illus., $3.75. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

This new edition of the author's earlier book on mitography is of great value because it bridges the gap between the highly technical and the extremely elementary works in the field. It covers all types of screen process printing. The approach is simple and understandable, making the book suitable for tradesmen and novices alike.

Subject matter ranges from preparation of handmade equipment and use of machines to information on inks, screen fabrics, drying, and imprinting on various surfaces and materials.

Included in the new edition are fifty additional pages, twenty-seven new illustrations, and four new chapters.

The Print: An Original Art Form for All

By Adele Lewis. Cloth, 32 pp., 8 by 11⅛ in., $2. Lewis Studio of Art and Fashion, New York, N. Y.

Here is an attractive account of printmaking. Included are descriptions of the woodcut, the etching, the lithograph, and the serigraph. Besides those sections on the standard four types, there is an additional one called "Experimental Prints."

Illustrated throughout by Bertram Goodman, the book has a beautiful layout in both color and black and white.

Bookbinding Made Easy

By Lee M. Klinefelter. Cloth, 86 pp., 6¾ by 9½ in., illus., $3. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

This is a revised edition, having been enlarged to keep up with recent trends and to enhance its value for beginner and expert alike. The first and last chapters on the history of bookbinding and automatic bindery plants, respectively, serve as a fitting introduction and conclusion to this revision.

In his opening remarks the author points out that his only purpose here, is to present in a simple and orderly way, a method of binding suitable for rebinding old books, or preserving magazines and other printed material.

By retaining the instructional scope, the clarity and other features which won wide acceptance for the original book, and by introducing new and significant material the author has again made a major contribution to the art of bookbinding.

This book includes a glossary of bookbinding terms more likely to be used by the beginner; also a bibliography, a list of dealers of bookbinding supplies, and an index.

Ceramics Handbook

By Richard Hyman. Cloth, 144 pp., $2.50. Arco Publishing Co., Inc., New York 17, N. Y.

Designed as a standard guide book, "Ceramics Handbook" gives a pictorial presentation, showing step by step instructions on how to make all types of potteryware, ceramic sculpture and jewelry. Starting with clay and wedging board, plaster bats and slip, the author shows how to form a clay object and how to shape and design figurines. He goes on to mold-making, slip casting, fettling, decorating, how to construct a kiln and how to operate it. After covering all phases of glazes and firing, he tells the reader how to construct his own pottery wheel.

The author has designed his material primarily for the amateur hobbyist, but he deals, too, with more intricate phases of his work giving much valuable information for the practicing ceramist.

Ceramics for Schools and Industry in Developing Countries

By Federico F. Costales and Delmar W. Olson. Paper, 120 pp., illus. Published jointly by the Philippines Bureau Public Schools and the United States of America International Cooperation Administration and the Stanford University Contract Team.

This book was prepared to meet the need for a ceramics text in schools in the Philippines as well as in other countries of Southeast Asia. It covers the history of ceramics, design in clay products, ceramic materials, preparation of clays, hand production methods, ceramic decoration, glaze and glaze materials, glaze composition and application, molds and mold making, industrial production processes, ceramic kilns, kiln operation, and construction of kilns and equipment.

Sculpture: The Basic Methods and Materials

By Lillian Johnson. Cloth, 90 pp., 7¾ by 10¼ in., illus., $3.95. David McKay Co., Inc., New York, N. Y.

In the introduction to this book, the author states the purpose of her presentation. Not specifically meant for the dedicated artist, this book is for fun, for the youngster who wants to be creative on a rainy day, for the high school student who wants to develop his creativity, for the schoolteacher who needs to present stimulating projects to the class, and for the camp counselor who hopes to make camp a creative experience. Also for the housewife, for the working man or woman who need a change of pace and an expressive outlet, or for the man who should put his tools to work on something besides home repairs, for the older, retired people who need a new and rewarding experience. For all these people there is presented here some simplified technical information about the methods and materials of sculpture.

Decorative Art

Edited by Terence Davies. Cloth, 172 pp., 8¾ by 11⅜ in., $9.50. The Viking Press, Inc., New York 22, N. Y.

After fifty years of acute portrayal of contemporary tastes in decorative design, *Decorative Art* presents its Golden Jubilee issue of 500 illustrations, including 30 striking color plates. Contents include displays of decorative taste in houses, apartments, and furniture; textiles; tableware; light fittings; ceramics and metals; and glass.

Touching a wide range of aesthetic appreciation from architecture to table setting, the display features some full-page depictions, some smaller, but each magnif-

icent, exquisite, or simple, as the subject demands. The color plates vary from bright multi-colored textile samples to deep, rich violet, blue and maroon vases.

The book is concluded with an index of all the architects, designers, artists, craftsmen, and manufacturers whose products appear in the preceding pages.

Commercial Art as a Business

By Fred C. Rodewald and Edward M. Gottschall. Cloth, 180 pp., $4.95. The Viking Press, Inc., New York 22, N. Y.

This is an enlarged edition of a book first published in 1954 and widely used by practicing commercial artists. The book has distinctive guidance values for boys and girls who expect to enter any branch of the commercial art world.

Introduction to Textiles

By Evelyn E. Stout. Cloth, 363 pp., 6 by 9¼ in., illus, $6.50. John Wiley and Sons, New York 16, N. Y.

This book fills a need in modern textiles studies, as it describes ninety of the most important natural fibers and thermoplastic or nonthermoplastic man-made fibers within the definitions and generic classifications of the new Textile Fiber Products Identification Act. Wash-and-wear developments and mixtures and blended fabrics are given considerable discussion. Modern texturizing processes for thermoplastic filament yarns are explained so as to be clear to the student or layman with little knowledge of the field.

The author treats the generic groups of natural and man-made fibers and the properties of the specific fibers within these groups. The presentation is enhanced by numerous photographs and illustrations. The interrelation of these properties of fiber and plastic are stressed, and also the conditions of use and testing.

Truck Farming

By Herman R. Goldberg and Winifred T. Brumber. Paper, 64 pp., illus., Syracuse University Press, Syracuse 10. N. Y.

Part of the Rochester Occupational Reading Series, this booklet contains several stories for young children concerning working with a tractor on a truck farm. At the end of each story, there are several work sheets relating to the story, to be filled in by the student.

Buildings, Equipment, and Facilities for Vocational Agricultural Education

By A. H. Hollenberg and E. J. Johnson. Paper, 90 pp., 40 cents. Superintendent of Documents, Government Printing Office, Washington 25, D. C.

The current, excellent programs of vocational agriculture require buildings and facilities carefully adapted for such courses. The present report takes up farm mechanics instruction and other aspects of the farm shop education program, and provides a planning guide for buildings and a list of tools and equipment. The illustration on the cover and Figure 6 suggest exterior designs worthy of the work carried on within their walls. No school farm shop need be anything but dignified and beautiful.

Summaries of Studies in Agricultural Education

Paper, 90 pp., 5⅞ by 9⅛ in., 35 cents. U. S. Department of Health, Education, and Welfare, Office of Education, Washington 25, D. C.

Supplement No. 13 to Vocational Division Bulletin No. 180, prepared by the Research Committee of the Agricultural Education Section, American Vocational Association.

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Equipment and Supply Listings

Printed annually as an attempt to help you in inventory checking, budget preparation, etc., this annual checklist provides you with a basic guide toward what common machines, tools, and materials are needed in your school shops. The areas served by the lists include: (1) woodworking, pg. 76; (2) metalworking, pg. 80; (3) electricity, pg. 88; and (4) automotive, pg. 92. Replacing previous years' lists of equipment and supplies in printing and ceramics is a list for general shop (adapted from one compiled for a class of 24 students by — Dr. Gilbert Hutchings of Western Michigan University in Kalamazoo) which begins on pg. 102.

Woodworking

tools

Bench

1. Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached. It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type.
2. Glue bench.
3. Stain, with metal-covered top.
4. Teacher's demonstration.
5. Glue clamp rack.

Bookcase

Bulletin Board

Cabinets

Wood or metal for filing tests, class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

Chairs

Teacher's and tablet arm.

Chalkboard

Permanent or portable.

Core Oven

For patternmaking class.

Desk

Teacher's with drawer compartments.

Drill

Portable electric.

Drill Press

Floor or table model.

Furnace

For melting soft metals (for patternmaking class).

Grinder

1. Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel.
2. Oilstone, with one fine and one coarse.

Jointer

1. 6- or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard.
2. 12-, 16-, or 18-in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

Lathes

1. 6- to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
2. Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand (for patternmaking class).

Mortiser

1. Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
2. Portable, vertical, hollow-chisel mortiser, bench type.

Planer

12-, 18-, 20-, 24-in., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

Sander

1. Belt, direct motor drive.
2. Disk, motor or belt driven.
3. Oscillating spindle, motor driven.
4. Portable, hand-plane type, direct motor drive.
5. Vertical spindle and disk sander.

Saws

1. Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
2. Cutoff, pedestal or swing type to be fitted with 12- to 16-in. saw.
3. Filing machine, direct motor drive.
4. Jig, direct motor or belt driven.
5. Portable band saw, 14 to 20 in. ball bearing, motor driven.
6. Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided.
7. Universal saw bench, 14 to 16 in., motor driven.
8. Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges.

Shaper

1. Motor drive, single or double spindle. Table to be equipped with removable center plate.
2. Portable shaper or router with a suitable selection of cutters.

Tennoner

Single end, with coping heads and cutoff saw.

Vises

Rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

Wood Trimmers

Complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class).

small tools

Awls

Brad, assorted sizes.

Bevels

1. Protractor.
2. Sliding T, 8 in.

Bits

1. Auger, 3/16 to 1 in., inclusive, by 16ths.

(Continued on page 78)

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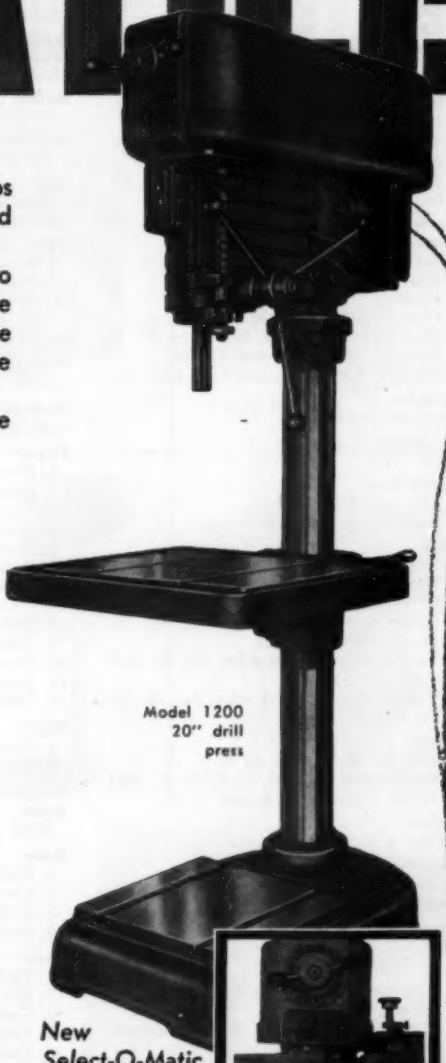
- **6-spline Spindle**



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(Lists continued from page 76)

2. Braces, ratchet type, 8-, 10-, 12-in. sweep.
3. Countersink, for wood, rose pattern, ½ in. and ⅝ in.
4. Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
5. Expansive, ⅞ in. to 1½ in.
6. Expansive, ⅞ in. to 3 in.
7. Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths.
8. Screw driver square shank, ¼ in., 5/16 in., ⅜ in.
9. Gimlet bits ⅛ in. to ⅜ in. by 1/16 in.
10. Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths.
11. Twist drill, straight shank, 1/16 to ⅜ in. inclusive, by 32nds.

Blowtorch

Brooms

Brushes

1. Bench duster, 10 in.
2. Floor.
3. Glue, round ½ and ¾ in. and 1 in.
4. Marking, camel's hair, No. 1 and No. 2.
5. Varnish, flowing, 2 and 2½ in.
6. Varnish, flat, ½, ¾, and 1 in., and 2 in.

Burnishers

Oval or round.

Can Opener

Wall type.

Carving Tools

1. Sets containing 6 tools.
2. Sets containing 12 tools.

Chisels

1. Cold, machinists', ⅛ and ¼ in.
2. Mortising chisel and bits, ¼ to ⅝ in. by 16ths.
3. Socket firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1½ in.
4. Socket firmer, plain edge, ½, ¾, and 1 in.
5. Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

Clamps

1. Bar, 24, 36, 48, and 60 in.
2. Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in. C-clamps, 6, 8, and 10 in.

Dividers

Wing, 6 in. and 10 in.

Dowel Plate

6 in. long.

Doweling Jigs

Drawknives

7 in.

Drill

1. Automatic hand, with 8 drill points.
2. Chuck, 0 to ⅜ in.
3. Hand, 0 to ⅜ in., for roundshank drills.
4. Star, for concrete, ½ and ¾ in.

Files

1. Auger bit, assorted, 6 in.
2. Cabinet, 8 and 10 in.
3. Card and brush.
4. Flat, wood, 10 in.
5. Mill, bastard cut, 12 in.
6. Sure form.
7. Round, bastard cut, 12 in.
8. Taper, slim, 5½ and 7 in. Rat tail.

First-Aid Cabinet and Supplies

Gauges

1. Bit, adjustable.
2. Jointer.
3. Marking, metal or hardwood.
4. Mortise, metal or hardwood.

Glass Cutter

Gouges

1. Tanged firmer, outside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
2. Tanged firmer, inside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
3. Spoon, ½, ¾, and 1 in.

Hammers

Claw, bell faced, 10-, 12-, 13-, and 16-oz.

Jars

Earthenware, 1 qt. capacity.

Knives

1. Jointer, to fit power machine (extra set).
2. Planer, to fit power machine (extra set).
3. Sloyd, 3-in. blade.

Levels

1. Wood, 24 in.
2. Machinists', 12 in.

Mallets

Hickory, 3- by 5-in. head.

Nail Sets

1/16- and 3/32-in. points.

Oilers

Bench, ½ pt., coppered, best grade. Non-rigid spout.

Oilstones

1. 1 by 2 by 8 in. in iron box on wood frame.
2. Gouge slip, medium, 4½ by 2⅛ by ⅝ by 5/16 in.
3. Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

Pincers

6 in. carpenters'.

Pinch Dogs

¾, 1, and 1¼ in.

Planes

1. Block, adjustable, 6 in. long, 1⅝-in. cutter.
2. Circular.
3. Combination, adjustable.
4. Core box.
5. Duplex, fillister and rabbet.
6. Fore, ⅛ in., 2⅛-in. cutter.
7. Irons, double.
8. Jack, 14 in., 2-in. cutter.
9. Jointer, 24 in., aluminum.
10. Round, wood, 1¾ in.
11. Router.
12. Smooth, 9 in., 1¾- or 2-in. cutter.

Pliers

1. Roundnose, 5 in.
2. Side-cutting, 6 in.

Putty Knives

Rasps

Half round, wood, 10 in.

Rules

1. Board.
2. 1 or 2 ft. graduated by 8ths and 16ths.
3. Shrink, ⅛ and 5/16 in.
4. 36-in. steel rule in 1/16 in.

Saws

1. Back, 12 in., 14 point.
2. Band, to fit power machine.
3. Compass, 10 in.
4. Coping, frames.
5. Coping, blades.
6. Crosscut, 9 tooth, 22 in. long.
7. Crosscut, circular for power machine.
8. Dado, ⅛ to 1 1/16 in. to fit power-saw arbor.
9. Hack, frames, 10 in. or adjustable.
10. Hack, blades, 10 in.
11. Keyhole, 10 in., 10 point.
12. Rip, 7 point, 22 in. long.
13. Rip, circular for power machine.
14. Set, 10 points per inch and finer.
15. Set, 10 points per inch and coarser.
16. Turning frame, 14 in.
17. Turning blades, 5/16 by 12 in., 10 tooth.
18. Miter box, 24 by 4 in. saw, 7 in. capacity at miter.

Scrapers

1. Cabinet.
2. Glue, triangular.

Screw Drivers

1. Cabinetmakers', 4, 6, 8, and 10 in.
2. Quick return, spiral ratchet.

Snips

Tinners', forged steel, 2½-in. cut.

Spokeshaves

Adjustable, raised handle, 10 in. long.

Squares

1. Combination, 12 in.
2. Try, iron handle, 8 in.
3. Framing, 2 ft.

Steel Figures

Hand cut, ⅛ in.

Tapeline

50 ft., steel.

Trammel Points

Adjustable metal frame, steel points.

Turning Tools

1. Calipers, 6 in. inside and outside.
2. Calipers, 12 in. inside and outside.
3. Parting tools, ⅛ in.
4. Round point, ¼, ½, and ¾ in.
5. Spear point, ¼, ½, and ¾ in.
6. Square point, ¼, ½, and ¾ in.
7. Turning chisels, ¼, ½, and ¾ in.
8. Turning gouges, ¼, ½, and ¾ in.
9. Turning skews, L.H., ¼, ½, and ¾ in.
10. Turning skews, R.H., ¼, and ½ in.

Vise

3-in. jaw, anvil face.

Wrenches

1. Slim, ¼ in. to 1 in. by ⅛ in. variation.
2. Adjustable, 8, 10, and 12 in.
3. Headless setscrew.
4. Pipe, 10 and 12 in.
5. S type or open-end type to fit ⅛ in. to 1-in. N.C. nuts.

materials and supplies

Alcohol

Benzine

Brads

⅜, ½, and ⅝ in. No. 20; ¾ and ⅞ in. No. 19; 1 in. No. 18; 1¼ and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14.

Carbon Paper

Black.

Colors

Dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermillion.

Colors

Ground, in oil or japan; burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermillion.

Decalcomania Transfers

Dowel Pins and Plates

Dowels

Hardwood, 3-ft. lengths, ¼, 5/16, ⅜, ½, ¾, and 1 in.

Enamel

1. Selected colors.
2. Undercoater.

Fillers

Paste: natural oak, dark oak, mahogany, white, and walnut.

Fillets

Leather, ¼ and ½ in.

Glue

1. Casein, hide, best grade cabinet.
2. Liquid, white glue.

Hardware

Brackets, buttons, butts, casters, catches, chain, chest corners, chest hinges, chest trimmings, corner braces, corner irons, corner plates, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports, table top fasteners.

(Continued on page 80)

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- **extra ruggedness**

Progressive school administrators are equipping their vocational workshops with Duro Power Tools. The reasons for this preference are many and varied—but it can be boiled down to three simple words—"more for less"! You need just glance at a Duro unit to see the many extras you get at no extra cost! Here are just a few: *Circular Saws* have larger tables, greater depth of cut at 45° and 90°, added work space ... PLUS ... *Drill Presses* with more capacity and stroke feed, a bu'lt-in light and switch ... PLUS ... *Lathes* offer 2" greater swing over bed, handwheels for tail stock and tool rest holder ... PLUS ... *Band Saws*, too, have 2" more capacity under foot, 104" blade, table extensions and light attachment ... PLUS!... *Belt and Disc Sanders* with miter gauge included, quick belt release, extra large platen size ... PLUS ...

These extras are only a few of the many found on the entire Duro line ... extras not found on other nationally advertised power tools.

There are many other advantages in owning Duro too—you get advanced design, lifetime ruggedness, precision accuracy, high operating efficiency and practically no maintenance cost. If you're looking for value and utility in power tools, choose DURO—it's your best bet!

GET THIS FREE CATALOG

Write today for your copy of the big Duro catalog showing the complete line of Duro circular saws, drill presses, band saws, lathes, scroll saws, sanders, routers, shapers and a full line of accessories. You'll get a closer look at the many "built-in" extras that make this line "second to none."

DURO Metal Products Co.

2651 N. KILDARE AVE. • Dept. 18 • CHICAGO 39, ILLINOIS

The World's Largest Manufacturers of Power and Hand Tools (Duro-Chrome)

(For more information from advertisers, use the postcard on page 131)

(Lists continued from page 78)

Hooks
1. And eyes.
2. Cup.
3. Screw.
4. Square screws.

Lacquer
Black, clear, ivory, medium green, red, thinner, white, and yellow.

Lumber
Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine.

In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and pattern-making.

Hardwood for furniture should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths.

Moldings
Assorted.

Nails
1. Common, 6d, 8d, and 10d.
2. Flathead, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14.
3. Finishing, 4d, 6d, and 8d.

Oil
1. Linseed, boiled.
2. Linseed, raw.
3. Machine.
4. Rubbing.
5. Lubricating.

Overlay Carvings

Panel or Plywood
3 ply, 5 ply, and 7 ply ¼ in. ⅜ in. and ½ in.

Pins
Escutcheon.

Pumice Stone
No. 0.

Rottenstone

Sandpaper
Garnet cabinet paper, 3/0, 2/0, 0, ½, 1.
Garnet finishing paper, 6/0, 4/0 also No. 360 finishing paper.
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order.

Screw Eyes

Screws
1. Flathead, brass, No. 3 by ⅜ in., No. 4 by ½ in., No. 5 by ⅝, and ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, 1½ and 2 in., No. 12 by 1¼, 1½, and 1¾ in.
2. Flathead, bright, No. 3 by ½ in., No. 4 by ½ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1, and 1¼ in., No. 10 by 1¼, 1½, and 1¾ in., No. 12 by 1½, 1¾, and 2 in., No. 14 by 2¼ and 2½ in. and 3 in.
3. Oval head, brass, No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., and No. 10 by 1¾ in.
4. Roundhead, blued, No. 3 by ⅜ and ½ in., No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, and 1½ in., No. 12 by 1½ in.
5. Roundhead, brass, No. 3 by ⅜ in., No. 4 by ½, and ⅝ in., No. 5 by ¾ in., No. 6 by 1 in.

Shellac
1. Orange, cut 4 lb. to the gal.
2. Sticks, assorted colors.
3. White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers. Do not overstock shellac. It loses its quick drying feature and remains "sticky."

Stains
Oil, spirit, or water. Fumed oak, dark oak, golden oak, light oak, mahogany, walnut, blond, grey, white, red maple.

Steel Wool
No. 0 and No. 2/0.

Turpentine

Twine

Varnish
Coach, flat, remover, spar, rubbing, dull, and satin finish.

Waste
Cotton, white.

Wax
Bees and finishing. Furniture polish.

White Lead

White Outdoor Paint

Metalworking

tools

Engine Lathes
9 in. to 16 in.

Drill Presses
Bench.
Large.

Milling Machines
Plain, No. 2.
Vertical.

Shaper
12 in. to 16 in.

Grinders
Bench.
Cylindrical.
Pedestal.
Surface.
Tool post.
Universal tool and cutter.
Wet.

Planer
24 x 24 in.

Radial Drill
3 ft.

Saws
Metal, band.
Power, hack.

Arbor Press

Heat Treating Furnace

Pyrometer

Lathe Milling Attachment

Lathe Taper Attachment

Arc Welder
200 amp.

Oxy-welding and Cutting Outfit

Chain Hoist
2 ton.

Air Compressor
4 ft. to 15 ft. capacity.

Dividing Head

Hardness Testing Machine

Die Filing Machine

Anvil
100 lb.

Electric Drill
Portable.

small tools

Arbors
Drill chuck, to suit requirements.
Reamers, various sizes.
Shell tool, various sizes.
Straight shank, for shell reamers and shell drills.
Taper shank, for shell reamers and shell drills.

Bearing Scraper

Benches

Bevel Protractor

Blowtorch

Brooms
For shop.

Brushes
Bench.
Floor.

Calipers
Hermaphrodite, 4 in. to 6 in.
Micrometer, outside, 0–1 in., 1–2 in., 2–3 in., 3–4 in.
Micrometer, inside, 1½–8 in.
Inside, 4 in. and 6 in.
Outside, 4 in. and 6 in.
Inside-outside vernier.

Indicators
Center.
Universal dial.
Speed.

Inspection Equipment
Dial snap gauge.
Dial bore gauge.
Bench micrometers.
Gauge blocks.
Bench centers.
Electronic measuring and inspecting equipment.
Intrimik.

Knurling Tool
Combination.

Lathe Dogs
Assorted sizes.

Level
Precision.

Ladle
Melting, 6 in.

Mandrels
Selected sizes.

Nippers
End cutting 5 in.

Oil Storage Tank
With pump.

Oilers
Solderless steel, bent spout.

Parallels
Adjustable.
Plain, assorted sizes.

Pliers
Slip joint.
Long nose.
Electrician's.
Side cutters.

Punches
Center, ¼ in. and ⅜ in.
Hollow, ½ in., ¾ in., 1 in.
Pin, assorted sizes.
Prick, ¼ in.

(Continued on page 84)

NEW DELTA Grinder helps you do more—

can't forget its goggles

No matter what type of grinding or buffing operations your students are doing, there's never a worry about safety with this new 7" Grinder. The Twin-Lite Safety Shields have double strength, shatter-proof glass, are mounted to permit easy swivel to side or rear when necessary and have bayonet-type bulbs that light both sides of the wheels. In addition, the wheel flanges furnish extra support (to meet ASA Safety Code Specifications) and the new small diameter motor with extended shafts provides plenty of clearance for difficult, bulky grinding jobs. And there are many more features you'll appreciate—features that make this the safest grinder on the market.

Over 32 years of Delta "know how" and service to the school shop field are your assurance that Delta tools are safe, practical and economical. Call your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) for all the details on the new 7" Grinder.

FREE BROCHURE: Pictures and describes the new Delta 7" Grinder available in bench and pedestal-type models. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 402C N. Lexington Avenue, Pittsburgh 8, Pa.

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another fine product by

ROCKWELL

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A COMPLETE INSTRUCTIONAL PROGRAM for YOUR SCHOOL

IN ELECTRONICS

COMPLETE EDUCATIONAL PROGRAMS FOR ALL LEVELS OF LEARNING

Fifty-one Textbooks
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Developed by University Engineering
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3. Electronic Technical Institute's program is designed specifically for educational purposes. The curriculum is accredited by the Engineers' Council for Professional Development.
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5. Through its Extension Division Electronic Technical Institute will train your instructors to effectively teach your Electronic courses.

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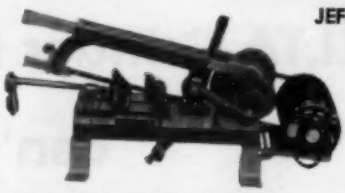
PRECISION BRAKE SERVICE EQUIPMENT for SCHOOL SHOPS

WRITE FOR CATALOG

BARRETT EQUIPMENT CO.
2101 CASS AVE. • ST. LOUIS 6, MO.

IAVE-3

These KELLER industrial power hacksaws are IDEAL for SHOP INSTRUCTION

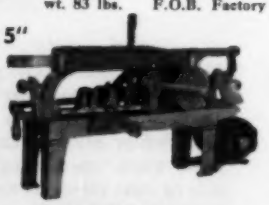


JEFFERSON "601" 5" x 4"

Cast base, 45° swivel vise, Oilite bearings, uses standard 10" & 12" blades, automatic stop switch. Ideal for school shops.

With motor, switch, wired ready-to-go. 4" x 4", wt. 83 lbs. **$85.00** F.O.B. Factory

NO. 1 HB BENCH MODEL, 5" x 5"



A rugged saw with cast base, Oilite bearings throughout, replaceable bronze guide bar bearing, automatic lift on return stroke, 45° swivel vise. Uses standard 10" & 12" saw blades.

Complete with ½ h.p., 110 V., 1 ph. motor & switch, wired, ready-to-go. **$199.00** F.O.B. Factory

NO. 3CH WET CUT, 6¾" x 6¾"

Pressure feed control plus 2 speeds permits most efficient cutting for any metal. Has foot lift to saw frame, automatic stop switch, other KELLER Features.

Complete with ½ h.p., 1 or 3 ph., A.C. motor, switch, wired ready-to-go. **$498.00** F.O.B. Factory

KELLER Power Hacksaws available in 5 sizes, 10 models. Ask your KELLER Distributor or write for Bulletin 257.

Sales Service Mfg. Co.

2365 University Ave., St. Paul 14D, Minnesota

SPEEDY MELT...

MODEL B-16
16 lb. Crucible

MELTING TIME

Aluminum	12 min.
Brass	20 min.
Gray Iron	40 min.

Sillimanite refactory lined . . . uses any type gas. Package unit includes furnace blower and three crucibles. **$350.00** (fob)

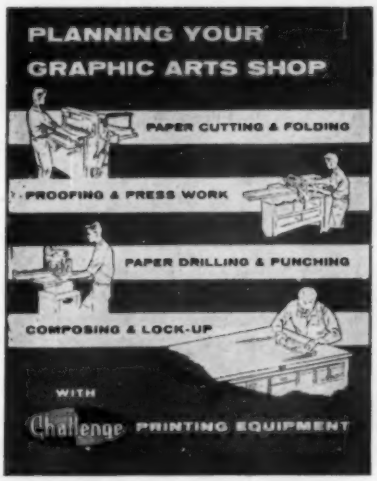
SPEEDY FORGE

MODEL F100-A

Clean . . . fast . . . instant heat. Developed for the school shop. Package unit includes forge, blower, hood and safety solenoid valve. **$240.00** (fob)

TONGS . . . SHANKS OTHER ACCESSORIES AVAILABLE

McENGLEVAN HEAT TREATING & MFG. CO., INC.
700-708 Griggs St. Danville, Illinois



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Helps You Plan Your Shop Equipment Needs

School supervisors, shop instructors, and others interested in planning new graphic arts departments or improving present facilities will find this new booklet a useful guide to the selection and ordering of Paper Cutting, Proofing, Paper Drilling or Punching, Composing and Lock-up Equipment, and Supplies. Write for your copy today. Address:

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20-page illustrated booklet — "Planning Your Graphic Arts Shop"

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in the Shop Equipped with . . .

King
BERKROY

PRODUCTION TOOLS

Rugged • Dependable • Designed for Industry

King/BERKROY Sheet Metal
SHOP-ON-A-BENCH
Complete unit — 5 tools on heavy steel stand:

12" BRAKE
20 ga. capacity

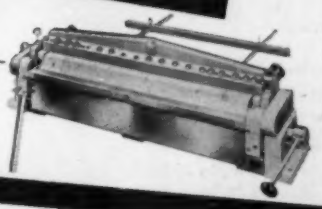
SHEAR with CLAMPING HEAD
Cuts circles, contours.

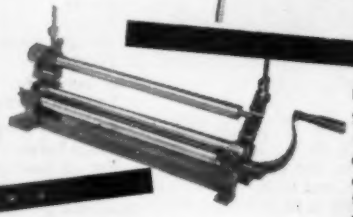
NIBBLER-SLITTER
12" throat capacity.

HAND PUNCH
Uses dies, blades, punches. Press-fits, too.

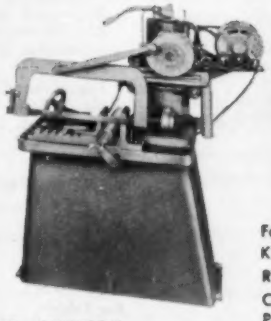
12" SLIP ROLLS
Forms cylinders, curves.

King/BERKROY
BOX & PAN BRAKE
24" - 30" - 36"
Locks to desired angle—16 ga. capacity—needle bearings—2½" pan depths.





King/BERKROY
SLIP ROLLS
12"-18"-24"-30"-36"
Oilite bearings—enclosed gears—finger tip adjustment—wire rolling grooves.



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King/BERKROY
RUBBER STAMP PRESS
Compact, safe—110 V-AC. Provides practical training in making rubber stamps at low cost.

King/BERKROY
HIGH-SPEED HACKSAWS
Two models: 4" x 4" and 6" x 6" capacities—depth limit switch.

For complete catalog information, write:

King MACHINE & MFG. CO.
Since 1910 1171 East 32nd Street
Los Angeles 11, California

(For more information from advertisers, use the postcard on page 131)

(Lists continued from page 80)

Planer gauge

Ratchet Threader
⅛ to ¾ in. pipe.

Reamers
Hand, various sizes.
Adjustable, various sizes.

Rivet Sets
Assorted sizes.

Rules
6 in., #4 graduation.
12 in., #4 graduation.

Scales
Shrink.

Screw Drivers
6 in. and 9 in. blades.

Scrapers

Screw Plate
Combination, ¼ to 1 in.

Scribers

Sine Bar

Snips
Straight.
Curved.

Sockets
For taper shank drills, #1, #2, and #3 Morse taper.

Soldering Copper
Electric.

Squares
Machinist, 12 in.

Surface Plates

Steel Figures
⅛ in.

Steel Letters
⅛ in.

Tapeline
50 ft.

Toolmaker's Buttons

Tapping Attachment

Taps and Dies
Machine screws.
Pipe.
N.F., ¼ in. to ¾ in.
N.C., ¼ in. to ¾ in.

Cans
Oil, ⅓ pint and 1 pint.

Center Testers

Chisels
Cape, ⅜ in. and ½ in.
Cold, alloy steel, ½ in. and ¾ in.
Diamond point, ⅜ in. and ½ in.
Round nose, ⅜ in. and ½ in.

Collets
Lathe.
Milling machine.

C Clamps
Assorted sizes.

Combination Squares
9 in. and 12 in., with hardened square, protractor, and center heads.

Counterbores
Straight shank and tapered shank, assorted sizes.

Countersinks
Combination.
Plain.

Cutters
Milling, assorted.

Dividers
Spring, 4 in. and 6 in.

Drills
Drifts.
Sleeves, different sizes.
Number, #1 to #60.
1/16 in. to ½ in., by 64ths.
Center.
High speed steel, taper shank, various sizes.
Straight shank, 1/16 in. to ½ in. by 64ths.
Ratchet.
Taper shank, ½ in. to 1½ in. by 16ths.

File Cards

Files
Die sinker's, various shapes.
Flat bastard, 8 in., 10 in., 12 in., and 14 in.
Half round double cut, 6 in., 8 in., 10 in., and 12 in.
Hand, smooth, 8 in., 10 in., and 12 in.
Mill, smooth, 8 in., 10 in., and 12 in.
Square bastard.
Swiss, various shapes.
Warding, double cut.

First-Aid Cabinet and Medical Supplies

Gauges
Center.
Depth.
Drill and wire.
Screw pitch.
Surface.
Thickness.

Glasses
Safety.

Hack-Saw Blades
Hand, 10 in., 18 teeth.
Power, 12 in., 14 teeth.
Band saw, ¼ in. to ½ in., 14 pitch, .025 gauge, 100 ft.

Hack-Saw Frames
Adjustable.

Hammers
Babbitt.
Ball peen, assorted sizes.
Soft face.
Riveting.
Setting.

Thread Wires
Flynn, 14 sets.

Trammels
24-in. set.

Tool Holders
Boring.
Cutting-off.
Planer.
R.H. and offset shank.
Shaper.
Slotter.
Straight shank.
Threading.

Tool Cutter Bits
Square, ¼ in., 5/16 in., ⅜ in., and ½ in.

V Blocks and Clamps

Wheel Dressers
For off hand grinder.
For surface grinder, diamond point.

Wrenches
Adjustable.
Single and double open-end.
Ratchet socket.
Adjustable hook spanner.
Pipe.
Tap, T-handle.

Vises
Machinist's, 4 in.

sheet metal

Awls
Scratch.
Ring.
Tinner's.

Bar Folder
30 in.

Benches
Sheet metal, with stake plate, 3 shelf, 60 x 40 x 32 in.
Work, steel, 72 x 28 x 36 in.

Box Brake
36 in.

Crimping and Beading Machine

Dividers
Wing, 10 in.

Drills
Straight shank, 1/16 in. to ½ in.

Furnace
Bench, gas, soldering.

Hammers
Riveting.
Tinner's.
Cross peen.
Ball peen, 8 oz., 10 oz.
Tinner's setting.
Hand groovers, 2, 3, 4.

Hand Reamer

Plumber's Scraper

Punches
Center, ⅜ in. stock.
Prick, ⅜ in. stock.
3, 4, 5, 6.

Rules
Steel flexible.
Circumference, 3 ft.

Soldering Coppers
Electric, ½ in.
½ lb., 1 lb.

Stakes
Hollow mandrel.
Double seaming.
Blowhorn.
Conductor.
Needle case.
Creasing.
Candle mold.
Bottom.
Square.

Tin Snips
Curved lip.
Hawk bill.
Compound lever, 8 in.

Slip Roll Former
36 in.

bench metal

Bending Jig

Bending Machine

Bolt Cutters
No. 0, 18 in.

Chisels
Cold, ⅜ in. and ½ in.

Calipers
Inside, 8 in.
Outside, 8 in.

Rivet Sets

Clamps
Toolmaker's, 3 in.
Carriage, 4 in. to 8 in.
Jorgensen, #2

Drills
Straight shank, set.
Electric, hand.
Breast.

Files
Flat, 8 in., second-cut.
Mill, 10 in., second-cut.
8 in., smooth-cut.

Hammers
Ball peen, 16 oz.
Cross peen, 16 oz.

Gauge
Sheet and plate.

End-Cutting Nippers

Pliers

Punches
Center.
Prick.

Rules
12 in. and 24 in.

Safety Glasses

Screwdrivers
6 in. and 8 in.

Squares
24 in.
Combination.
Try, 10 in.

(Continued on page 86)

5 Metal Work Stations For $1,650

The sons and grandsons of these five boys can learn metal working on these same Di-Acro machines—they're boyproof to the core!

And now your school can have these famous five Di-Acro machines at a saving of $185! Order them now in one "Package Deal" for only $1,650, compared to the regular single-item price of $1,835. This is oftentimes no more than what you would pay for a single machine in other areas of shop instruction. Di-Acro Package Deal above includes:

- Spartan Model No. 24 Di-Acro Roller, 24" width, 20 gauge capacity.
- Spartan Model No. 24 Di-Acro Box and Pan Brake, 24" width, 16 gauge capacity.
- Di-Acro Notcher, 16 gauge capacity.
- Spartan Model No. 36 Di-Acro Shear, 36" width, 16 gauge capacity.
- Shear stand, welded steel, 33" high, storage shelf
- Di-Acro Bender No. 2 capacity ½" bar, ¾" tube
- Bend-R-Pak No. 2, bender accessories
- Bender Stand, welded steel, 33" high, two shelves
- Machinery Table, 72" x 36", welded steel, shelf

This group of machines represents a complete range of metal forming processes. Anything that can be cold formed in a variety of materials, ie.— sheetmetal, bar and flat stock, tubing, etc., can be demonstrated and duplicated by your students.

Remember, this is just one of eight Di-Acro "Package Deals" in arrangements to fit all school needs and to fill out equipment you may already have. Every one is an outstanding bargain on the longest lasting boyproof equipment you can buy!

Send coupon for full information—today!

You reflect the materials and processes of industry with:

di-acro pronounced die-ock-ro PRECISION METALWORKING EQUIPMENT

O'NEIL-IRWIN MFG. CO.
483 Eighth Avenue, Lake City, Minn.

☐ Please send me complete information on your "Package Deals" for school workshops.

☐ Please send me complete information on your project materials for classroom use.

NAME_____

POSITION_____

SCHOOL_____

ADDRESS_____

CITY_____ STATE_____

(Lists continued from page 84)

Scriber

Saw
- Hack
- Jeweler's, piercing, 5 in.

Tinner's Snips
- Straight.
- Curved.

Taps and Dies
- N.C.
- N.F.

Vises
- Machinist's bench.
- Pipe.

Wrenches
- Box, ¼in. to 1 in.
- End, ¼ in. to 1 in.
- Crescent, 6 in., 8 in., 10 in.

art metal

Anvils
- Flat, round head.
- Flat, square head.
- Mushroom head.

Chisels
- Chasing.
- Matting.
- Engraving.

Dome Anvil Head

Files
- Flat, 8 in., bastard.
- Flat, 8 in., smooth cut.
- 8 in., second-cut.
- Needle.

Grinders
- Buffing.
- Stone.

Drills
- Straight shank, set.

Hammers
- Ball peen, 8 oz., 12 oz., and 16 oz.
- Chasing.
- Forming.
- Planishing.
- Art peening.
- Art metal.
- Embossing.

Lathe
- Metal spinning, 15 in.

Mallets
- Wood.
- Rubber.
- Fiber.
- Rawhide.

Metal-Spinning Tools, Set

Master Extension Arm

Saws
- Jeweler's, 5 in. deep
- Hack.

Slope Anvil Head

Squares
- Combination.
- Try, 10 in.
- Bevel

T Stakes
- Assorted.

foundry

Bellows
- Molder's.

Barrows
- Coke.
- Foundry.
- Scrap.

Bench Rammer

Bulb Sponge

Benches
- Core making.
- Molding.

Blowers
- For furnaces.

Core Oven

Crucibles

Cupola
- For foundry coke, or electric; capacity, ¼ to 1 ton.

Flasks
- 2- or 3-part, steel, or snap type.

Furnace
- Gas, with blower, for melting non-ferrous metals.

Grinder
- Floor model.

Hand Picks
- For cleaning inside of cupola, 1/14 to 2½ lb.

Handles
- Pouring, crucible.

Pyrometer

Riddles
- Foundry.

Rack for Flasks

Sand Sifter

Safety Glasses

Sand-Blast Outfit

Snapflask Jackets

Spoon and Gate Cutter

Slick and Oval

Sprue Cutter

Trowel
- Finishing, 6 in.

Taper and Leaf Slick

Tongs
- Crucible.

Tumbling Barrel

materials and supplies

Abrasive Cloth
- Aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls.

Abrasive Wheels

Acetylene Gas
- In drums for welding.

Aluminum
1. Pigs for foundry.
2. Sheets, tubing, rounds, shapes, wire, etc.
3. Aluminum circles for spinning, 4" to 15" dia., 20 to 18 ga.

Babbitt Metal

Bearing Blue

Belt Dressing

Belt Lacing Material

Belt Leather

Bolts
1. Carriage, selected sizes.
2. Lag, selected sizes.
3. Machine, selected sizes.
4. N.F., selected sizes.
5. Stove, flat or roundheads, selected sizes.

Brass
1. Bars, 3/32, 1/8, 3/16, and ¼ in. thick; ½ to 1 in. wide, 8 to 10 ft. long, selected sizes.
2. Round rods, 3/16 to ½ in. by 16ths, selected sizes.
3. Sheets, 28 to 32 American gauge, 12 in. wide by 72 to 84 in. long, selected sizes.
4. Strips, 1/32 and 1/16 in. thick, ½ to 1½ in. wide, 50 ft. to a coil, selected sizes.
5. Threaded rods, Nos. 6 to 10, in 24 in. lengths, Nos. 12, 14, ¼, and 5/16 in., in 24 in. lengths, selected sizes.
6. Wire, soft, 8, 11, and 14 American gauge, selected sizes.
7. Wire, spring, 8 to 22 American gauge, selected sizes.

Casehardening Compounds

Chaplets
- Single and double head.

Coal
1. Charcoal for foundry or forge.
2. Coke for foundry.
3. Forge.

Copper
1. Sheets, 8 to 25 American gauge, 30 by 60 in., selected sizes.
2. Tubing, outside diameters, 3/16, ¼, 5/16, ⅜, and ½ in.; thickness of wall, 1/32 in.; lengths, 8 to 12 ft., selected sizes.
3. Wire, soft, 2- to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes.

Core
1. Compounds.
2. Flour.
3. Paste.
4. Oil.
5. Wax-vent wire.

Cutting Compounds

Etching Material for Art Metal

Firebricks and Clay
- For foundry.

Fire Handles
- Assorted sizes.

Graphite
- For foundry.

Iron
- Pig, for foundry.

Lacquer
- Transparent and colored, for finishing.

Lubricant
- Metal spinning.

Nuts
- S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds.

Oil
1. Boiled linseed.
2. Lubricating.
3. Quenching and hardening.

Packing
- Round, sheet, square, or tubular.

Paint
- Black asphaltum.

Pins
1. Cotter, 3/32 to ¼-in. diam. from ½ to 2 in. long.
2. Flask, for flask repairs.
3. Taper, Nos. 0 to 6, ¾ to 2 in. long.

Pumice Powder

Rivets
1. Copper, with burrs, Nos. 7 to 14, lengths, ⅜ to ¾ in., selected sizes.
2. Iron, No. 14 gauge to 3/16 in., flathead or button head, ¼ to 1 in. long, selected sizes.
3. Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes.

Sand
1. Molding in 350-lb. barrels or 800-lb. casks.
2. Parting, in 350-lb. barrels or 800-lb. casks.

Screws
1. F.H. or R.H. iron or brass, selected sizes and kinds.
2. Cap and machine, iron or brass, selected sizes and kinds.
3. Set, head and headless.

Solder
- Acid or rosin core; bar, or solid wire.

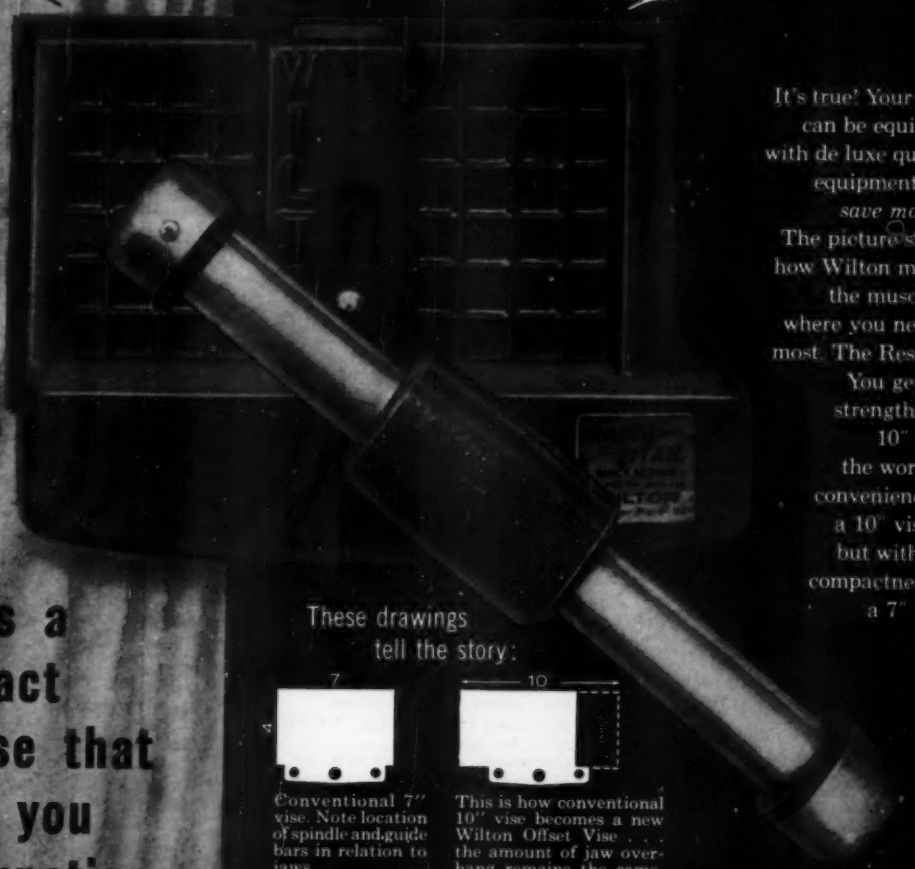
Soldering Paste or Salts

Steel
1. Bessemer, rod, 1/64 to ⅜ in. by 64ths, in 4-ft. lengths, selected sizes.
2. Bars, cold rolled, ⅛ to ⅜ in. thick, ½

(Continued on page 88)

New! Vertical clamping feature!

THE WILTON 7" OFFSET VISE



It's true! Your shop can be equipped with de luxe quality equipment *and save money!* The picture shows how Wilton moved the muscle to where you need it most. The Results: You get the strength of a 10" vise, the working convenience of a 10" vise... but with the compactness of a 7" vise.

here's a compact 7" vise that gives you the function and strength of a 10" vise!

These drawings tell the story:

Conventional 7" vise. Note location of spindle and guide bars in relation to jaws.

This is how conventional 10" vise becomes a new Wilton Offset Vise . . . the amount of jaw overhang remains the same.

This is where the offset 7" vise pays off!

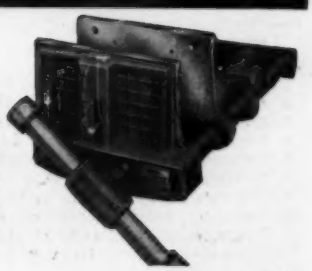
The offset design gives 2¾" of jaw surface beyond the left guide bar, and that's where you need it for vertical holding. The compact 7" construction conserves your precious bench space.

Write now for complete information or an obligation-free look at the most Revolutionary shop vise on the market!

WILTON

Wilton Tool Mfg. Co. • Schiller Park, Illinois

Available with conventional or rapid action nuts; either aluminum or hardwood handles.



VE-31

(Lists continued from page 86)

to 2 in. wide, 12-ft. lengths, selected sizes.
3. Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes.
4. Rods, hexagon and square, cold rolled, ¼ to ¾ in., in 12-ft. lengths, selected sizes.
5. Round, cold rolled, diameters ⅜ to 1 in., lengths 12 ft., selected sizes.
6. Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in.
7. Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in., selected sizes.
8. Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes.

Tin
1. 1C, 1X, 20 by 48 in.
2. 1XX, 20 by 48 in.

Washers and Burrs
1. Copper burrs, Nos. 3 to 14, in 1-lb. boxes.
2. Iron burrs, Nos. 3 to 14, in 1-lb. boxes.
3. Brass washers, 3/16 to ½ in. by 16ths.
4. Iron washers, 3/16 to ½ in. by 16ths.

Welding Fluxes

Welding Rods
(All rods come in 24-in. lengths).
1. Brazing, 1/16, ⅛, 3/16-in. diameter

Wire
1. Annealed, 16 to 34 W and M gauge, selected sizes.
2. Coppered market, 5 to 18 W and M gauge, selected sizes.
3. Coppered spring, 2 to 18 W and M gauge, selected sizes.
4. Galvanized, 5 to 18 W and M gauge, selected sizes.
5. Piano, Nos. 2/0 to 36, selected sizes.
6. Tinned, 16 to 24 W and M gauge, selected sizes.
7. Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes.

Zinc
1. Sheet, Nos. 4 to 14, sheets 36 by 84 in.
2. Cast aluminum, 3/16, ¼, and 3/8-in. diameter.
3. Cast brass, 3/16 and 3/8-in. diameter.
4. Cast bronze, ¼-in. diameter.
5. Cast copper, 3/16 and ¼-in. diameter.
6. Cast iron, 3/16, ¼, 5/16, and 3/8-in. diameter.
7. Low carbon steel, ⅛, 3/16, and ¼-in. diameter.

White Lead
For machine shop.

Electrical Shop

testing and motors

Annunciators
1. Automatic needle drop.
2. Gravity drop.
3. Manual needle drop.

Armatures
Burnt out, for repairing.

Armature Tester
Growler.

Battery Charger
Commercial.

Circuit Breakers
1. Air, single pole, overload, 25 amp., 550 volt.
2. Air, single pole, underload, 15 amp., 550 volt.

Controllers
1. For multiple-speed motor.
2. For 1 h.p., 110-volt series.

Generators
1. Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
2. Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing.
3. Auto generators of different makes.

Gravity Cells

Magnets
Testing, 10,000 ohm.

Meters
1. Ammeter, standard, 60 amp., a.c.
2. Ammeter, standard, 60 amp., d.c.
3. Ammeter, student, 60 amp., a.c.
4. Ammeter, student, 60 amp., d.c.
5. Voltmeter, standard, 0–10 volt, d.c.-a.c.
6. Voltmeter, standard, 110–220.
7. Voltmeter, standard, 125 volt.
8. Voltmeter, standard, 125 volt, d.c.
9. Voltmeter, student, 110 volt, d.c.
10. Voltmeter, student, 110 volt, a.c.
11. Wattmeter, standard, 110-220 volt, 30–60 amp., d.c.-a.c.
12. Wattmeter, student, 110–220 volt, 30 amp., a.c.-d.c.
13. Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes.
14. Volt-OHM-Millimeter.
15. Voltage indicators — jumping jacks.

Motors
1. Auto starter, different makes.
2. Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing.
3. Compound, 1 h.p., 110 volt, d.c.
4. Multiple speed, 1 h.p., 3 phase, 220 volt.
5. Series, 1 h.p., 110 volt, d.c.
6. Shunt, 1 h.p., 110 volt, d.c.
7. Split phase and repulsion, a.c., 110 volt, single phase, assorted.
8. Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes.
9. 3 phase, 1 h.p., a.c., 220 volt, various makes.
10. 3 phase, 2 h.p., 220 volt, a.c., various makes.
11. Universal, fractional h.p., 110 volt, different makes.
12. Universal, variable speed, ½ h.p.

Platform Scale
110 lb. capacity.

tools

Bench Grinder

Benches
Plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets and circuit breakers.

Bits
1. Auger, ¼ in. to 1 in. by 16ths.
2. Auger, 11/16 in., 18 in. long.
3. Drill for wood, square shank, ⅛ in. to ½ in. by 16ths.
4. Expansion.
5. Extension, 18 in.
6. Screw driver, ¼ in.

Blackboard
Permanent or portable.

Blowtorches
1 qt. size.

Bookcase

Braces
Ratchet type, 8-in. swing.

Bulletin Board

Cabinets
Wood or metal for filing class records, instruction sheets, drawings, etc.

Chairs
Teacher's and tablet arm.

Compass Saw

Coil
1. Spreader.
2. Taper.
3. Winder.

Desk
Teacher's, with drawer compartments.

Drill
1. Breast.
2. Concrete, ⅜ in., ½ in., ¾ in., 1 in.
3. Hand.
4. Portable, electric.
5. Twist, 1/32 in. to ½ in. by 64ths.

Drill Press
1. Bench, hand, or power driven.
2. Heavy, power driven.

Files

First-Aid Cabinet and Supplies

Hack Saw
1. Blades, 10 in., 24 tooth.
2. Frames, adjustable.

Hammers
1. Claw, 12 oz.
2. Machinist's, ball peen.

Hickey
½ in. and ¾ in.

Hole Saws
Selected sizes.

Lathe
1. Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long.
2. Speed.

Pliers
1. Gas, 6½ in. and 8 in.
2. Side cutting, 6 in.

Punch
For metal molding.

Punches
Assorted.

Reamers
1. Pipe burring, ¼ in. to 1 in.
2. Pipe burring, ½ in. to 2 in.

Rules
1. 48 in. zigzag.
2. 72 in. zigzag.

Screw Drivers
3 in., 5 in., and 8 in.

Shears
For cutting metal molding.

Solder Dippers

Soldering Coppers and Guns
1. Assorted.
2. Electric.
3. Handles.

Stocks and Dies
For pipe threads, ½ in. to 1 in.

Vises
1. Machinist's, 4 in.
2. Pipe.

Wrenches
1. Adjustable, 6 in. and 8 in.
2. Pipe, 10 in., 12 in., and 14 in.
3. Socket, combination.

(Continued on page 92)

NEW COLUMBIAN VISES

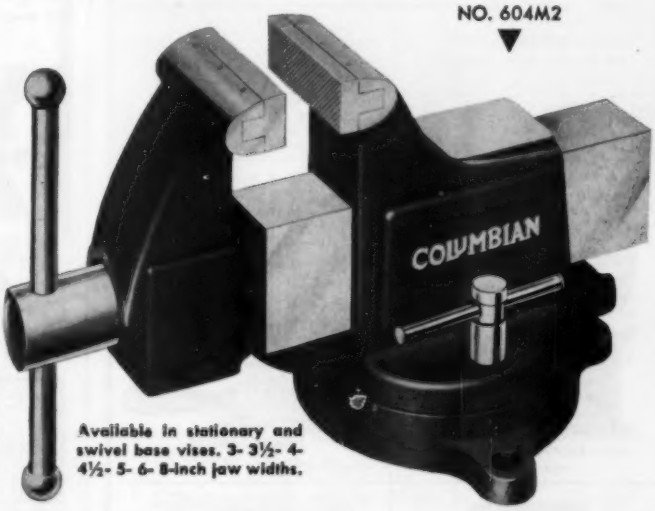
essential tools in every school shop

When you train students on Columbian Vises, you give them actual experience on the same fine, modern tools they will later use in industry. Columbian Machinists' Vises and Columbian Woodworkers' Vises are both new designs. They are the finest ever manufactured by Columbian . . . retain all of the famous time-tested Columbian features . . . plus innovations which contribute to faster, smoother operation, greater productive capacity and longer life.

COLUMBIAN
Malleable Iron Machinists'
VISES
Guaranteed Unbreakable

Popular features include "T" section hardened tool steel replaceable jaw faces . . . steel handle balls forged from handle stock . . . self-lubricating graphite bronze thrust bearing. Malleable iron castings, reinforced at all points of stress, are guaranteed unbreakable. 3- 3½- 4- 4½- 5-inch stationary base vises easily convert to swivel base type with addition of swivel kit.

NO. 604M2



Available in stationary and swivel base vises. 3- 3½- 4- 4½- 5- 6- 8-inch jaw widths.

NO. 7RDW

Write for Catalog No. 60
for best advise about **VISES** . . .
see your **COLUMBIAN** distributor

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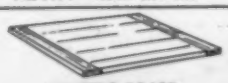

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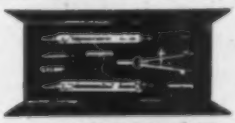

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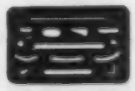

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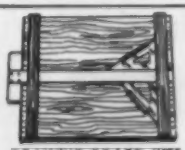

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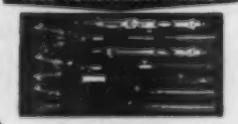

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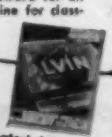

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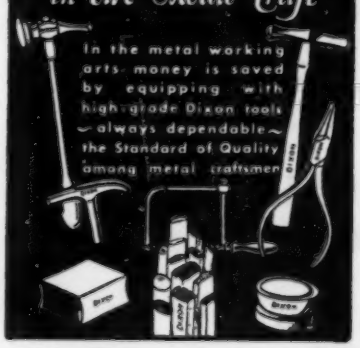
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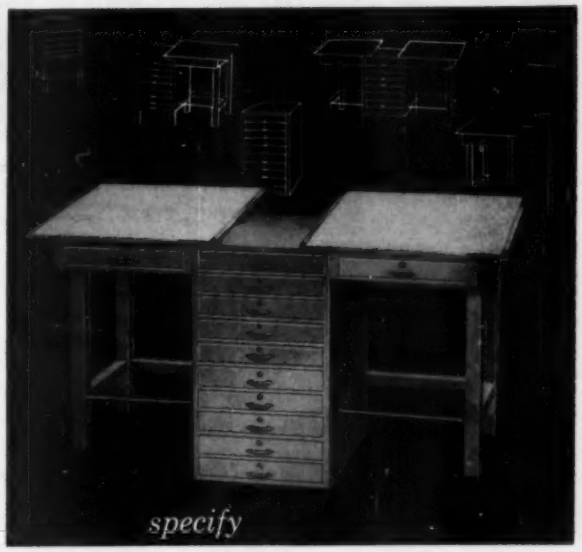

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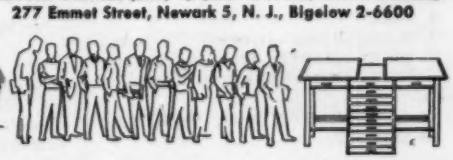


(For more information from advertisers, use the postcard on page 131)

(Lists continued from page 88)

materials and supplies

Abrasive Cloth
Aluminum oxide, 1, 1½, and 2 in. wide.

Armored Cable
1. 2 wire, No. 14, single strip.
2. 3 wire, No. 14, single strip.
3. Box connectors.

Attachment Plug

Bar Hangers

Batteries
Dry cells.

Battery Acid
1.300.

Battery Sealing Compound

Box Cleats

Brads
¾ in., No. 19 and 1½ in., No. 16.

Brake Lining
¼ by 2 in.

Brushes
Carbon, for motors and generators.

Burglar Contacts
1. Open circuit.
2. Closed circuit.

Bushings
1. Loom, No. 1 and No. 2.
2. "Jiffy" loom, No. 2.

Buzzers

Cleats
Unglazed porcelain, 2 wire.

Clips
Test, with insulators, Universal Nos. 22, 23, 24 and 25.

Commutator Cement

Conduit
1. Bushings, ½, ¾, and 1 in.
2. Box connectors, for flexible.
3. Couplings, for flexible.
4. Lock nuts, ½, ¾, and 1 in.
5. Rigid, ½, ¾, and 1 in.

Condulet
1. Fillings, ½ in., LL, LR, and LB.
2. Covers, ½ in., blank.

Door Openers
Mortised.

Fish Paper
.0125 in. thick.

Fixtures
Brass, chain, suspension.

Fixture Studs

Fuses
1. Plug type, renewable, 125 volt, 15 amp.
2. Cartridge type, renewable, 125 volt, 30 amp.
3. Renewals for plug fuses.
4. Renewals for cartridge fuses.

Ground Clamps
⅜ to 1 in. assorted.

Hickey Grips
½ and ¾ in.

Lamps
1. Mazda, selected as wattages and voltages.
2. Guards for brass sockets.

Lugs
25 and 50 amp. Solder and solderless.

Lumber
2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides.

Molding
1. Metal.
2. Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches.

Nuts
Iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20.

Outlet Boxes
4 in. square, with one round blank cover, and one cover with bushed opening.

Pipe Straps
Galvanized, ⅜, ½, ¾, and 1 in.

Push Buttons
1. Return call, 3 point.
2. Single.

Receptacles
1. Flush, duplex.
2. Porcelain cleat, 660 watt, 250 volt.
3. Concealed.
4. Covers.

Rectifiers
Tungar, for charging from 1 to 12, 6- and 12-volt batteries.

Relays
Dixie.

Resistance Boards
For testing.

Resistance Units
125-ohm.

Rheostats
1. Compression, 275 watt.
2. Field, for shunt and compound motors.

Rosettes
Wood.

Rotary Converter
5-kw. capacity, 3 phase a.c., 110 volt d.c.

Screws
1. Anchors, 8/32, 10/24, 12/24, 14/20.
2. Machine, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ⅜ in., 8–32 by ½ in., 8–32 by 1 in., 10–32 by ⅜ in., 10–24 by ⅜ in., 10–24 by ¾ in., 10–32 by ¾ in., 12–24 by 1 in.
3. Machine, brass, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ½ in.
4. Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
5. Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

Sleeving
No. 1, white; No. 1, blue; and No. 1, red.

Sockets
1. Brushed, brass pull chain, keyless, key.
2. Porcelain, keyless, with caps.
3. Porcelain, key, with caps.

Socket Caps
¼ and ⅜ in. brushed.

Solder Wire
50/50 size, No. 10.

Soldering Paste
2-oz. cans, noncorrosive.

Soldering Salts
1-oz. cans, noncorrosive.

Speed Counters
0–9999.

Spring Balances
0–30 lb.

Starting Boxes
1. For compound motors, various makes.
2. For shunt wound, 1 h.p., 110-volt motors. Overload release.
3. For shunt wound, 1 h.p., 110-volt motors. No voltage release.
4. Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors.

Storage Batteries
6 volt.

Switch
1. Battery, 4 point.
2. Bases, porcelain, for 10-amp. switches.
3. Boxes, 2¾ in. deep.
4. Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits.
5. Entrance, safety, 3 pole, 30 amp., 250 volt.
6. Flush, push button, S.P., D.P., 3 way, 4 way.
7. Surface, S1, S3, and S4.
8. Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
9. Surface, snap, electrolier.
10. Surface, snap, S.P.D.P., 3 way, 4 way.

Switchboard
As required.

Tachometer

Tacks
Double-pointed No. 10.

Tape
1. Friction, ½-lb. rolls.
2. Rubber, ½-lb. rolls.

Telegraph Sets
Including sounders, keys, and relays.

Telephones
1. Complete bridging, independent phones.
2. Couch vestibule telephones.
3. Receivers, transmitters, induction coils, condensers, and bridging switch hooks.

Transformers
1. Bell ringing, 6, 8, 14 volt.
2. Single phase, 110–220 volt, 2K.V.A. porcelain, 5⁄16 by 3 in., 5⁄16 by 5 in., and 5⁄16 by 10 in.

Tubing
Flexible nonmetallic, ¼ and ⅜ in.

Washers
1. Iron, ¼ and ⅜ in.
2. Brass, ¼ and ⅜ in.

Wire
1. Annunciator, No. 18 or No. 20.
2. Fixture, No. 18, single yellow, with marker.
3. Rubber covered, solid copper, No. 10, black.
4. No. 10, white.
5. No. 14, black.
6. No. 14, white.
7. Rubber covered, No. 16, brewery cord.
8. No. 18, lamp cord, green and yellow.
9. S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive.

Automotive

materials and supplies

Air Hose
25' length, ¼" I.D., 5 ply red, complete with ¼" pipe fittings and quick connect couplings.

Air Blow Gun

Batteries
1. 6 volt.
2. 12 volt.

Battery Bolts
5⁄16" x 1½" U.S.S. lead coated battery terminal bolts complete with nuts.

(Continued on page 94)

EASIEST WAY TO TEACH PRECISION

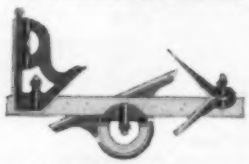
Starrett TOOLS

Inspire your boys to better, more accurate work with Starrett Tools — the kind skilled craftsmen use. Can you think of an easier way to demonstrate precision methods . . . and the tools that make precision possible? Your Industrial Supply Distributor will show you other Starrett Tools recommended for school shop use.

No. 436 SATIN CHROME MICROMETER CALIPER

Rugged construction with tapered frame, no-glare Satin Chrome Finish on sleeve and spindle, easy-to-clean black enameled frame. 0-1″ size shown, larger sizes available.

No. 9 COMBINATION SET



Furnished with square head, center head and 180 degree protractor head. Heads have wrinkled black enamel finish. Blade has quick-reading graduations. 12″ size shown.

SATIN CHROME STEEL RULES

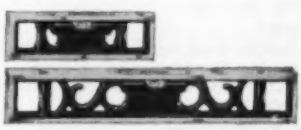
No-glare, easy-reading Satin Chrome Finish also resists rust, stains and corrosion. Available with fractional or decimal graduations in all types and sizes.

No. 92 9″ DIVIDER

Holds standard long pencil or steel point. Long legs for wide range, fine adjustment for accurate setting. Heavy-duty construction — legs won't wander on rough work.

No. 819 AUTOMATIC CENTERING PUNCH

Centers screw-starting holes for hinges, latches, other hardware. No hammer needed — press down and it strikes. Features include: lightweight sure-grip aluminum handle, self-centering locating sleeve, adjustable striking force.

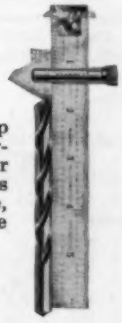


No. 132 SERIES BENCH LEVELS

Moderately priced precision levels with main vial and double plumbs. Base accurately machined with groove for use on cylindrical work. 6″ and 12″ sizes shown. Larger sizes available.

No. 22C DRILL POINT GAGE

Measures drill lip lengths and insures correct 59° point angle for best cutting. Also serves as plain rule, hook rule, depth gage, try square and slide caliper.



STARRETT 16MM SOUND MOVIE

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AVAILABLE FOR FREE SHOWING TO YOUR SHOP CLASSES

- Highlights in the history of precision measuring
- Precision measuring from basic rules to latest precision methods
- The tools and instruments that make precision possible
- New, simplified instruction: How to use and read the Micrometer and Vernier tools.

Tells the story of precision measuring in 30 interest packed minutes. Arrange for a free showing to your group.

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PRECISION TOOLS

World's Greatest Toolmakers

BIG NEW STARRETT CATALOG

Describes the complete line including many tools priced to fit school shop budgets. Write for your free copies. Address Dept. CE, The L. S. Starrett Company, Athol, Massachusetts, U. S. A.

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLESAWS • BAND SAWS • BAND KNIVES

(For more information from advertisers, use the postcard on page 131)

(Lists continued from page 92)

Battery Clips
1. "B" battery clips cadmium plated.
2. 50 ampere battery charging and test clips, lead coated.

Battery Compound
Battery sealing compound.

Binding Posts
Screw type.

Blades
1. Hand hack saw, 24 teeth per inch.
2. 10", 32 teeth per inch hand hack saw.

Brushes
1. 1½" flat.
2. 14" x 1¼" steel wire, curved handle.
3. 6" diam. steel, wheel.
4. 8" bench or counter.

Bulbs, Light
1. 6 and 12 volt, sealed beam.
2. 6 and 12 volt, bayonet base.
3. Battery charger bulb (specify ampere capacity).

Cable
1. Extension cord, double conductor, molded rubber covered, 18 ga. heavy duty.
2. Primary, single conductor, stranded copper braid and lacquer covered, 14, 16, and 18 gauge.
3. Secondary, 7 millimeter, rubber.
4. Starter cable, No. 1 gauge rubber and woven cover insulation.
5. Starter cable, No. 6 gauge rubber and woven cover insulation.

Cable Terminals
1. Battery cable ground lugs for No. 1 starter cable.
2. Battery cable ground lugs for No. 6 starter cable.
3. Battery cable terminals, universal type or equal.
4. Clip type, high tension terminal for 7mm. cable.
5. Terminals, as-aos-11 solderless.
6. Terminals, 3/16" hole primary.
7. Terminals, 5/16" spade type primary.

Checks, Tool
Brass, 1" round.

Cleaning Compound
Oakite, Stoddart solvent or other material depending on the type of cleaning tank used.

Clips
Crocodile.

Cotter Pins
1. 1/16" x ¾", box of 1000.
2. 3/32" x 1", box of 1000.
3. ⅛" x 1½", box of 1000.

Drills
1. H.S.S., 1/16", jobbers, straight shank.
2. H.S.S., 1/16", jobbers, straight shank
3. H.S.S., 3/32", jobbers, straight shank.
4. H.S.S., 3/16", jobbers, straight shank.
5. H.S.S., 1/64", jobbers, straight shank.
6. H.S.S., 7/32", jobbers, straight shank.
7. H.S.S., ¼", jobbers, straight shank.
8. H.S.S., 17/64", jobbers, straight shank.
9. H.S.S., 5/16", jobbers, straight shank.
10. H.S.S., 21/64", jobbers, straight shank.
11. H.S.S., 23/64", jobbers, straight shank.
12. H.S.S., 3/8", jobbers, straight shank.
13. H.S.S., 25/64", jobbers, straight shank.
14. H.S.S., 27/64", jobbers, straight shank.
15. H.S.S., 7/16", jobbers, straight shank.
16. H.S.S., 29/64", jobbers, straight shank.
17. H.S.S., ½", jobbers, straight shank.

Emery Cloth
No. 2/0, 9" x 11".

File
1. 10" flat bastard (24 minimum).
2. 10" half round bastard (6 minimum).
3. 10" half round lead float (4 minimum).
4. 10" hand smooth (12 minimum).
5. File handle, large, medium, small(specify size), (24 minimum).
6. 10" mill smooth (12 minimum).
7. 10" round bastard (6 minimum).
8. Ignition point file (10 minimum).
9. Regulator point file, Delco-Remy model W-19.
10. 6" saw file, extra slim taper (4 minimum).
11. Warding, 6" smooth (4 minimum).

Fuses
Automobile SFE 4, 6, 10, 14, 20 amps.

Gasoline
Commercial grade (as needed).

Gauge (Thickness Gauge)
1. .002" thickness, ½" width, ground thickness gauge stock.
2. .003" thickness, ½" width, ground thickness gauge stock.
3. .005" thickness, ½" width, ground thickness gauge stock.
4. .010" thickness, ½" width, ground thickness gauge stock.
5. .015" thickness, ½" width, ground thickness gauge stock.

Grease
Chassis, purchase in quantity depending on amount used.

Grinding Compound
2 compartment oil mixed grades A & E.

Grinding Wheels
When requesting grinding wheels for replacement purposes, be sure to specify the material bond, grain, size, and hardness or grade.

Handle, Hammer
1. 14" length, 16 oz. machinist's.
2. 18" length, 24 oz. machinist's.

Hose
1. ¾", rubber, 2 ply, 50' lengths.
2. Radiator hoses are molded for specific cars.

Hose Clamps
Universal type, to fit 1" to 3" O.D. hose.

Hydraulic Brake Fluid

Hydrometer Floats
1. Automobile storage battery, hydrometer float only.
2. Automobile radiator hydrometer float only, calibrated for alcohol, glycerine, and prestone.

Insulator
1. Rubber to fit mueller No. 85 clips, red mueller No. 87.
2. Rubber to fit mueller No. 85 clips, black mueller No. 87.

Nuts, Machine Screw
1. No. 6-32, hex, steel.
2. No. 8-32, hex, steel.
3. No. 10-32, hex, steel.
4. No. 10-24, hex, steel.

Nuts
1. ¼"-20 hex, semifinished.
2. 5/16"-18 hex, semifinished.
3. ⅜"-16 hex, semifinished.
4. 7/16"-14 hex, semifinished.
5. ½"-13 hex, semifinished.
6. ¼"-28 hex, semifinished.
7. 5/16"-24 hex, semifinished.
8. ⅜"-24 hex, semifinished.
9. 7/16"-20 hex, semifinished.
10. ½"-20 hex, semifinished.

Nuts
1. ¼"-28 castellated hex, semifinished.
2. 5/16"-24 castellated hex, semifinished.
3. ⅜"-24 castellated hex, semifinished.
4. 7/16"-20 castellated hex, semifinished.
5. ½"- castellated hex, semifinished.

Oil
S.A.E. No. 20, engine oil (as needed).

Paint (for shop maintenance)
1. Black, quick drying enamel.
2. Red, quick drying enamel.
3. White, quick drying enamel.
4. Machine enamel, gray.

Pans
Automobile drain pans, approximately 3 gallon capacity, height not to exceed 5", galvanized.

Plugs
1. Attachment, molded soft rubber two prong, body only.
2. Attachment cap only.
3. Three prong for grounding.

Rags
Wiping, bleached and washed. (Some schools may prefer to use paper "kimwipes," or, wiping rags supplied and washed by a local laundry service).

Safety Glasses

Safety Washers (grinding wheel)
Order by pair, specify arbor size and diameter flange for grinding wheels.

Sal Ammoniac
For cleaning soldering coppers.

Sandpaper
1" width, No. 000, 50 yd, roll for commutators.

Screws, Machine
No. 6-32 x 1", round head.
No. 8-32 x 1½", round head.
No. 10-32 x 1½", round head.
No. 10-24 x 2", round head.

Screws, Cap
¼"-20 x ¾" to 1½", hex.
5/16"-18 x ¾" to 1½", hex.
⅜"-16 x 1¼", hex.
½"-13 x 2", hex.
¼"-28 x ¾", hex.
5/16"-24 x 1¼", hex.
⅜"-24 x 1½", hex.
7/16"-20 x 1¼", hex.
½"-20 x 2", hex.

Sealing Compound
Permatex.

Solder, Paste
All purpose, noncorrosive.

Solder Wire
No. 5 spools, ⅛" diameter, 50-50 alloy.

Spark Plugs
14 millimeter metric.

Staples
Insulated, ½".

Tape
1. ¾" friction tape.
2. ¾" rubber tape.

Tire Air Chuck

Tire Gauge

Tire Repair Kit
1. Tubeless repair kit.
2. Vulcanized patches.

Tire Repair Cement
½ pint can with brush in can.

Thermometers (Lab.)
Calibration 10° F.-220° F., 12" length, glass stem.

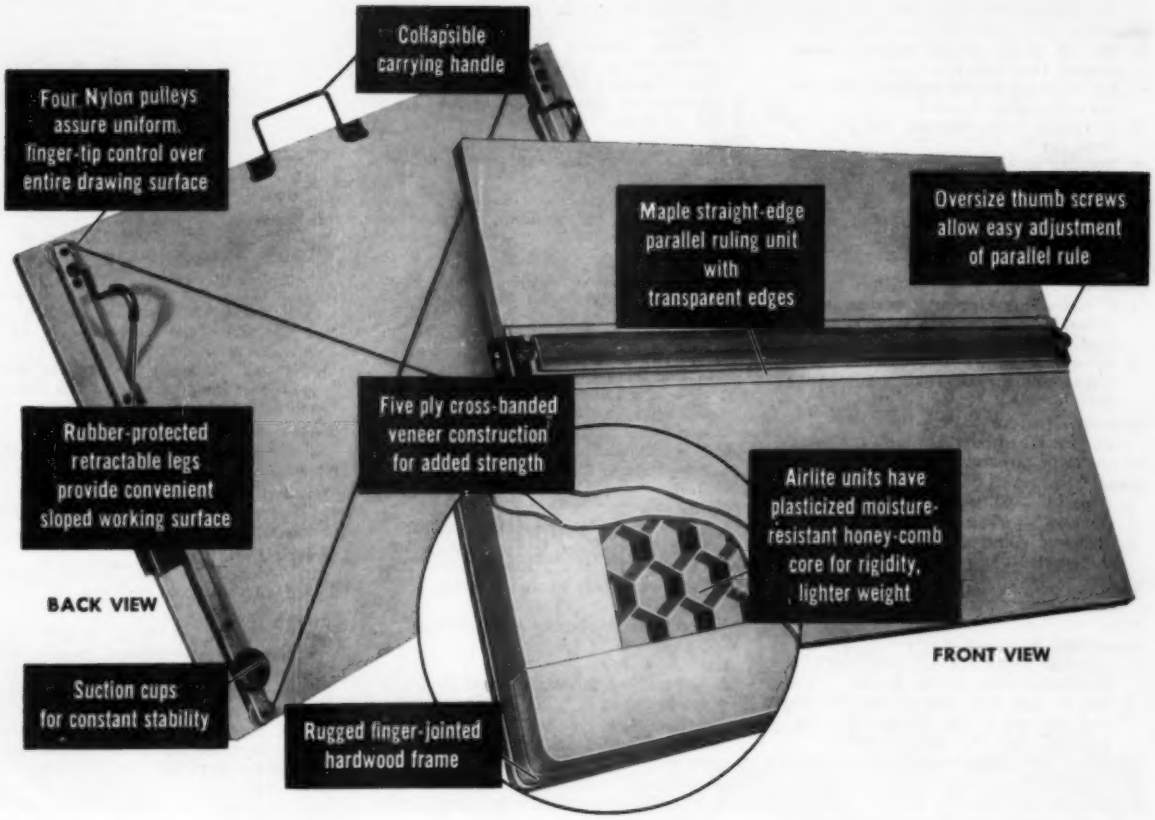
Tubing Fittings
Kit of assorted tube fittings consisting of:
⅛" S.A.E., and inverted flare types.
¼" S.A.E., and inverted flare types.
5/16" S.A.E., and inverted flare types.

Tubing
1. ⅛" O.D. annealed copper, automotive.
2. ¼" O.D. annealed copper, automotive.
3. 5/16" O.D. flexible metal, galvanized steel.
4. 2" O.D. flexible galvanized tubing for exhaust lines.

Washers, Flat
1. ¼", 18 gauge thickness.
2. 5/16", 16 gauge thickness.
3. ⅜", 16 gauge thickness.
4. 7/16", 14 gauge thickness.
5. ½", 14 gauge thickness.

Washers, Lock
1. 3/16".
2. ¼".
3. 5/16".
4. ⅜".
5. 7/16".
6. ½".

(Continued on page 96)


Collapsible carrying handle
Four Nylon pulleys assure uniform finger-tip control over entire drawing surface
Maple straight-edge parallel ruling unit with transparent edges
Oversize thumb screws allow easy adjustment of parallel rule
Five ply cross-banded veneer construction for added strength
Rubber-protected retractable legs provide convenient sloped working surface
Airlite units have plasticized moisture-resistant honey-comb core for rigidity, lighter weight
BACK VIEW
FRONT VIEW
Suction cups for constant stability
Rugged finger-jointed hardwood frame

POST Paraltilt *offers classroom economy plus outstanding design features*

Conceived for improved classroom effectiveness, the POST Paraltilt is a professional-quality combination drawing board and parallel ruling unit. It is realistically priced for educational use and "belongs" in the modern technical classroom. Years of use and abuse have been designed and built into every feature of POST Paraltilt • Compact, lightweight, rugged . . . the Paraltilt offers unusual versatility. It fits standard storage racks—it has rubber-protected retractable legs for proper drawing elevation—its suction cups provide constant stability—the satin-smooth lacquer finish is scratch resistant—and a collapsible handle makes it easy to carry. The Airlite honey-comb core boards are extremely lightweight, portable • The ruling unit is a transparent plastic-edged maple straight-edge with mahogany grip. The straight-edge is readily leveled or adjusted by means of two oversize thumb screws. Four easy-action nylon pulleys provide uniform up and down fingertip control over entire board area • POST Paraltilt is available in six sizes: Airlite core boards: 12″ x 17″; 18″ x 24″; 20″ x 26″; 23″ x 31″; Solid basswood core boards: 24″ x 36″; 31″ x 42″ • For further information regarding these lightweight, portable combination units, write the Educational Sales Department, Frederick Post Company, Box 803, Chicago 90, Illinois.

POST

(Lists continued from page 94)

Wire
1. No. 18 single strand copper, cotton covered (bell wire).
2. No. 24 single strand copper, single cotton and enamel covered.
3. Resistance wire, chromel No. 27, 3.25 ohms per ft.
4. Bonding wire, annealed iron, stove pipe No. 16.

small tools

Calipers
1. 6" — inside spring nut release, screw thread adjustment. High grade spring steel.
2. 6" — O.D. spring nut release, screw thread adjustment. High grade spring steel.

Carburetor Tool Kit
Complete set of overhaul tools for popular makes of carburetors.

Chisels
1. Cape ¼" — 6" length forged tool steel.
2. Cold ½" — 6" length forged tool steel.
3. Diamond point ¼" — 6" length forged tool steel.

Dies
(For economy purchase taps and die in sets).

Taps — Dies
1. Machine screw — 6-32, 6-40, 8-32, 8-36, 10-24, 10-32, 12-24, 12-28.
2. Set of taps and dies in national fine and national coarse threads, ¼", 5/16", ⅜", 7/16", ½", ¾", ⅞", and 1" sizes.
3. Set of tap wrenches and die stocks for above.

Dividers
6" stiff spring tapered spool, high quality spring steel legs with replaceable needle-points.

Drill Stand
Fractional 1/16" to ½".

Drill, Electric
(*See* Special Equipment Section).

File Card
Steel back frame and face. Tempered steel wire bristles, complete with steel tapered pick.

Flaring Tool
3/16" to ⅝" O.D. tubing size.

Gauges
1. Shoe and drum gauge.
2. Tire gauge, standard tire pressure gauge, 0-60 lb. capacity.
3. Screw pitch gauge, 60°V type thread, 22 pitches, 32 to 74.
4. Thickness gauge, 2 5/16" length blade, 22 blades .004" to .025" tempered and encased.
5. Thickness gauge, 6" blade, 8 tapered leaves, .002, .003, .004, .006, .008, .010, .012, and .015 leaves.

Hammers
1. Machinist — 12 oz. ball peen, forged steel, heat treated and polished, wooden handle.
2. Machinist — 24 oz. ball peen, forged steel, heat treated, wooden handle.
3. Claw hammer, adze eye, curved claw, bell shaped head. Wooden handle, forged head.
4. Sledge — 7 lb. bell face, adze eye, forged hardened and tempered steel. Wooden handle.
5. Soft faced head, wooden handle.

Knife, Putty
1¼" wide 3½" long, tempered polished elastic steel.

Micrometers
1. Inside diameter — calibrated to .001", range 2"-9½", calibrated thimble with grooved extensions for quick adjustment.
2. Outside diameter — drop forged "I" section frame. Anvil, spindle, and barrel high quality, ground steel. Standard calibrations. Size 0-1", 1-2", 2-3", 3-4" (4 sizes).

Oiler
5 oz., 3" spout, steel can, tempered steel bottom.

Oil Stone
4" x 1¼" x ½" medium, complete in wooden case.

Oil Measure
2 qt. heavy gauge galvanized steel combination measure, funnel and spout. All seams soldered.

Pliers
1. 6" — slip joint.

Piston Ring Inserter Pliers
2. 7" — long tapered long nose.
3. 8" — combination slip joint, forged tool steel.
4. 7" — diagonal cutter mechanic's pliers, forged heat treated high grade tool steel.

Punches
1. Drive pin, 8" knurled hardened steel, set of 8: 1/16" dia. to 5/16" dia.
2. Center, ¼" x 4", forged alloy steel hammer tested, knurled handle.

Rivet Set
Hand type for button head rivets.

Rule, Steel
1. 6" steel scale.
2. 12" x 1" width stainless steel, tempered, graduated in 1/8", 1/16", 1/32", 1/64".

Saw, Hand Hack
8" — 12" adjustable frame, 2¾" throat, pistol grip.

Screw Drivers
1. 3" plastic molded handle square shank, alloy steel.
2. 4" plastic molded handle square shank, alloy steel.
3. 6" plastic molded handle square shank, alloy steel.
4. 8" plastic molded handle square shank, alloy steel.
5. Offset at both ends, forged and tempered tool steel, set of 6 for 3/16" to ¼".
6. Phillips head screw driver, alloy steel tempered deep fluted blade. Set of 4 to fit points Nos. 1, 2, 3, and 4.
7. Clutch head screw driver, alloy steel tempered. Set of 4, Nos. 1, 2, 3, and 4.

Screw Extractor
Straight shank, deep fluted blade, hardened tool steel, set of six.

Scriber
⅛" dia. 10" double point hardened tool steel.

Snips, Tin
⅝" electric soldering copper, 200 watt tool steel, straight blade ground and polished.
2. Curved — 3" drop-forged, hardened tool steel.

Soldering Iron, Electric
1. Straight — 3" drop-forged, hardened ground steel extension rods. Angular complete with cord, tip and stand.

Square, Combination
Tempered 12" blade with forged square, center, protractor heads.

Stamps, Steel
1. 3/16" hand cut figures 1 to 0.
2. 3/16" hand cut letters A to Z.

Taps
(For economy purchase taps and dies in sets).
1. Machine screw taps — hand tap, plug type, straight fluted, high quality, carbon steel fine ground thread; 1-set: 6-32, 6-40, 8-32, 8-36, 10-24, 10-32, 12-24, 12-28.
2. N.C. Standard — hand tap plug type, national course standard thread, high quality carbon heat treated steel, 1-set: ¼"-20, 5/16"-18, ⅜"-16, 7/16"-14, ½"-13, 9/16"-12.
3. National fine standard, hand tap, plug type high quality carbon heat treated steel, 1-set: ¼"-28, 5/16"-24, ⅜"-24, 7/16"-20, ½"-20, 9/16"-18, ⅝"-18, ¾"-16.
4. National Standard Pipe, ⅜", ¼", ⅜".

Tap Wrench
1. T-handle, single handle, adjustable chuck, hardened jaws, made of quality steel.
2. Machine screw tap wrench, T-handle adjustable vise jaw, for holding machine screw tap size 6—32 to 12-28, quality steel.
3. National Standard tap wrench, adjustable vise jaw, for holding tap sizes ¼" to ¾", high quality steel.

Wrench, Adjustable
Single and adjustable jaw, forged steel. replaceable parts 6", 8", 10", 12".

Wrench, Monkey
10" length, 2" capacity, forged jaws and handle with nonmetallic fitted handle.

Wrench, Pipe
10" — length, ⅜" to 1" pipe capacity, forged and hardened tool steel.

Wrench, Spanner
Adjustable hook drop forged carbon steel hardened and finished smooth. Set of 3, capacity ¾" to 4¾" diameter.

It is recommended that only high quality alloy steel wrenches and sockets be purchased. Specifically, they should have lifetime guarantees so that cracked sockets and sprung wrenches can be replaced free of charge.

Wrenches, Box
Double broached hex, double offset drop forged chrome-moly alloy steel. Lifetime guarantee and replaceable. 4 to 8 sets: 4½" to 6" (short length), 3/16" and ¼", ¼" and 5/16", 5/16" and ⅜", ⅜" and 7/16". 8" to 19" (long length), ¼" and 5/16", 5/16" and ⅜", 7/16" and ½", 9/16" and ⅝", ⅝" and 11/16", ¾" and ⅞", 15/16" and 1", 1 1/16" and 1⅛".

Wrenches, Electrical
Open end, double end, thin chrome-moly forged steel, chrome plated electrical set of 9: 13/64" to 7/16" openings.

Wrenches, Socket
½" square drive and/or ⅜" square drive, thin wall, double broached, chrome alloy heat treated sockets. Chrome plated finish, 4 to 8 sets: 7/16", ½", 9/16", 5/8" extra thin for Ford V-8 85 h.p. connecting rods, 19/32", 5/8", 21/32", 11/16", ¾", 25/32", 13/16", ⅞", 15/16", 1". Deep sockets: 7/16" to 1", ½" and/or ⅜" drive. Special spark plug sockets, 13/16" with rubber inserts.

Wrench, Handle
11" — ½" and/or ⅜" square drive sliding "T" handle, alloy steel.

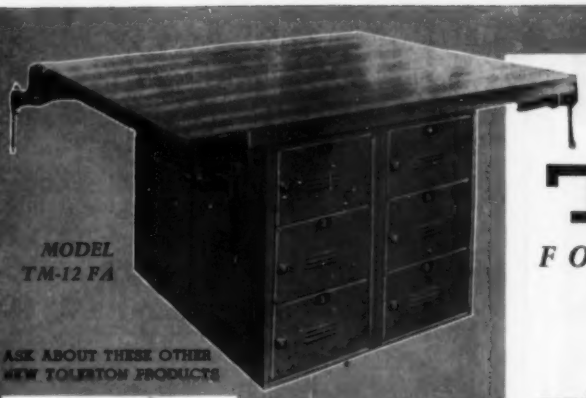
Wrench, Extension Drive
1. 5" — ½" and/or ⅜" square drive extension, alloy steel, lock-in plug connector.
2. 10" — ½" and/or ⅜" square drive extension, alloy steel.

Wrench, Ratchet (Reversible)
Ratchet gear, ½" and/or ⅜" square drive, quick reversible.

Wrench, Drive Adapter
1. ⅜" square female and ½" square male.
2. ⅜" square male and ½" square female.

Wrench, Tappet Adjusting
1. 7/16" — ½" open end, thin alloy steel wrench.
2. ½" — 9/16" open end, thin alloy steel wrench.

(Continued on page 100)



MODEL TM-12 FA

ASK ABOUT THESE OTHER NEW TOLERTON PRODUCTS

ARC WELDING BENCH

MODEL TAW-3668

With 20 gauge steel "see-thru" welding shield to eliminate eye flashburn while students observe demonstration.

MOLDING BENCH

MODEL TMB

Sand storage area completely lined with heavy-gauge, hot dipped galvanized steel. Back panel and top shelf used to store tools. Removable maple shaker bars.

NEW

TOLCO

FOUR STUDENT BENCH

Gives 50% more horizontal project storage space

The "built-to-take-it" heavy-gauge steel TM-12 FA provides 12 individual lockers, 6 each side. Each locker is numbered 1 to 6, and fitted with ballpoint fasteners and mating pulls, and lugs for padlocks.

Tolco tops are built to take it, too. Laminated of 100% Northern hard maple, an exclusive steel spline, and ⅜" through bolts, they'll never bow or sag. Want more information? Write, wire or phone.

Established 1894

THE TOLERTON COMPANY

265 North Freedom Avenue • *Alliance, Ohio*

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GROWN UP! PRICED DOWN!

The all new VEMCO 33/20". A precision drafting machine capable of accommodating drawings as large as 34" x 44". Combining much of the versatility, convenience and precision workmanship of America's finest drafting machines, yet Priced At Only $59.50, subject to regular educational discounts.

Also available—the Model 3300 with special disc brake and automatic 15° indexing—slightly higher in price.

Write now for new 4-page descriptive brochure.

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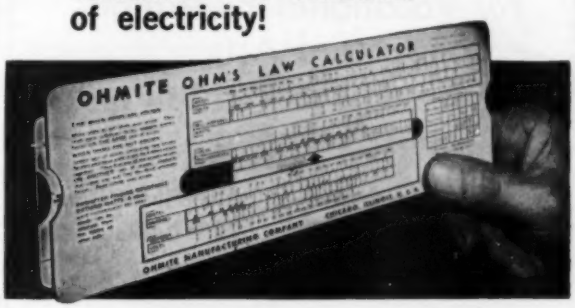
766 So. Fair Oaks Avenue
Pasadena, California

VEMCO

A time-saving calculator for students of electricity!



OHM'S LAW Calculator and Slide Rule

A time-saving calculator for your students after they have learned Ohm's Law. Solves Ohm's Law and many parallel resistance problems simply, quickly, accurately—with only one setting. Slide rule scales multiply, divide, find squares, square roots, etc. Only 9" x 3", heavily varnished cardboard, it fits conveniently into the pocket. Also available in durable vinylite at $1.50.

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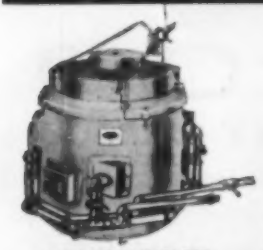
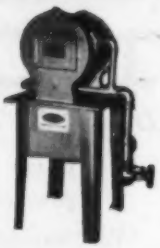
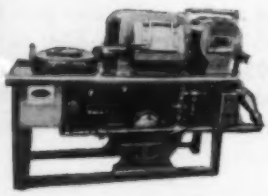


MELTING FURNACES

FORGE FURNACES



OVEN FURNACES



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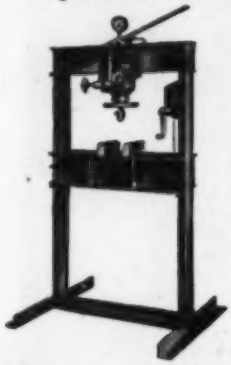
for School Shops

Shop training is most helpful when your pupils use the same practical presses they are apt to find when they work after graduation.



DAKE HYDRAULIC PRESS Model 25 H

Includes pressure gauge, hand wheel for rapid advance, automatic ram return, and table lifting device. 25 tons capacity.

DAKE ARBOR PRESSES

Have large opening and slotted table plates. Available in single and compound leverages, with capacities from 1 to 25 tons.

Catalog No. 350 describes Dake Presses suitable for school shops. Write for a free copy.

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BUYS FULL-SIZE
¾" Collet Capacity
RAM & TURRET
VERTICAL MILL

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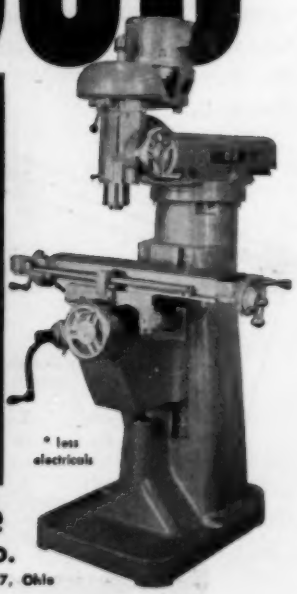

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Printing: A Practical Introduction to Graphic Arts, Jackson

Ceramics, Roy

Mechanical Drawing, 6th Ed., French and Svensen

Automotive Mechanics, 6th Edition, Crouse

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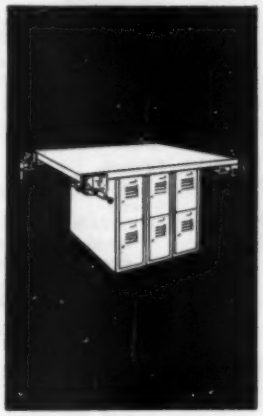

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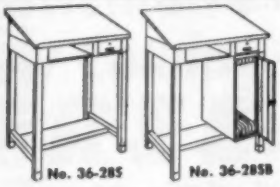
THIS CREST REPRESENTS QUALITY IT APPEARS ON PARENT DRAWING TABLES



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AND DRAWING ROOM EQUIPMENT

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- ★ Storage Equipment
- ★ Layout Tables
- ★ Instructor's Desks
- ★ Stools and Chairs

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- We specialize in designing and equipping school shops.
- Send us your list for spring quotations.
- Send us your list for your new shop area, we will bid all items.
- Send for our 1961-62 school catalog, 200 pages of standard brand items.
- Personalized and prompt attention to all inquiries and orders.
- We specialize in custom shop furniture and drawing tables.

MIDWEST SHOP SUPPLIES
521 — 5th STREET, SIOUX CITY 1, IOWA

(Lists continued from page 96)

3. ⅝" — 1 1/16" open end, thin alloy steel wrench.

Wrench, Universal Joint
⅜" and/or ½" sq. drive.

testing and special

Air Compressor
1. 3 h.p., capacity, max. pressure 150 PSI, complete with steel tank, regulator, pressure unloader, safety valve and piping.
2. Air blow gun — forged brass, button valve type, 25 CFM at 100 PSI, specify hose size.
3. Air line chuck — ball foot type with serrated shank. Specify hose I.D.

Aligning Jigs
For connecting rods.

Arbor Press
25 ton hydraulic.

Battery Equipment
1. Batteries, storage — automobile 6 volt, 100 amp. hour capacity; 12V, 50 amp. hr.
2. Battery carrier.
3. Battery charger, tube rectifier type, 6 amp. capacity for 12 6-volt or 6 12-volt batteries.
4. Battery charger, fast charger selenium rectifier type with charging rate controlled by battery temperature or timer.
5. Battery hydrometer with built-in thermometer.
6. Battery syringe to water cells.
7. Battery voltmeter, high rate discharge O-3V, high capacity resistance unit, prong type.

Bench
1. Electric test — facilities for testing: generators, regulators and starting motors, 3 h.p. min. motor, variable speed drive for approximately 500-6000 r.p.m. tachometer, voltmeter, ammeter, shunts and resistors.
2. Work, with vises (4" vise).
3. Work, portable with vise.

Brake Equipment
1. Lining grinder with necessary adapters to grind and centralize car brake shoes.
2. Drum lathe with necessary attachments for both turning and grinding, including brake cylinder hones, lining clamps, and brake drum micrometer.
3. Reliner — combination riveter and grinder.
4. Lining bonder and remover (check electrical supply).
5. Brake bleeder.

Containers
1. Can, safety gasoline — 1 gal. 24 ga. lead coated, non-spill sealed. Trigger type pouring lip.
2. Can, waste — galvanized 12" x 15" can with legs and spring lift cover.

Chain Hoist
With overhead trolley and monorail, 3 ton capacity.

Cleaner
1. Steam — low pressure type (check local code).
2. Ring groove cleaner.

Cord Extension Light
Complete with molded rubber handle and socket. 20 feet super-service cable, molded rubber attachment plug and lamp guard.

Compass
Magnetic type needle.

Creepers
4 universal casters attached for easy movement.

Degreaser
With drum, filter and pump type circulated cleaning fluid.

Drill
1. Electric portable, ¼".
2. Electric portable, ½".
3. Press, 17", with motor and chuck.

Dynamometer
1. Chassis hydraulic absorption type.
2. Engine hydraulic absorption type.

Engine Lifting Equipment
Specify engine lift is to fit.

Engine Support Bars
Specify engine bars are to fit.

Fender Covers

Furnaces
Gas soldering.

Gauges
1. Cylinder gauge — dial indicator, universal type attachments complete in storage container.
2. Compression meter, dial face for use in spark-plug chamber.

Grease Dispensers
(Chassis pressure type).

Grinder
1. Cylinder, with motor and hone.
2. Electric bench grinder, 2 seven or eight-inch dia. wheels, complete with motor, switch, guards, tool rests and face shields.

Growler
110 V-60 cycle, for testing generator and starter armatures.

Honing Machine
Electric motor driven, for piston pins, king pins, etc., capacity to hone holes from ⅛" to 2⅝" inside diameter.

Hot Plate
Electric — 110 V-60 cycle.

Jacks
1. Floor roller, hydraulic type, 2 ton.
2. Hand stationary hydraulic type, 1½ ton.

Lathe
Metal bench type, 9" swing, back geared. motor driven.

Lifts
1. Automobile, hydraulic, twin post.
2. Automatic transmission, hydraulic lift.

Magnet
Permanent bar type ¼" x 1" x 6".

Meters
1. AVR 75 ampere D.C. 6, 12, and 24 volt scales d.c. complete with standard load resistor. Encased in durable portable case with heavy leads and clips attached.
2. Meter, ammeter — 30 amp. capacity, encased in shock proof case.
3. Meter, voltmeter — 20 volt rating.

Radiator Hydrometer
Calibated for alcohol, glycerine and ethylene glycol with built-in thermometer.

Spring Tension Scales
1. Brush and point spring tension scale 0-48 oz. spring type draw scale with hooked prong.
2. Steering gear checking scale 0-4 lbs. spring type draw scale with steering wheel grip.

Stands
1. Car stand (horse) — 2 ton min. cap.
2. Engine build up stand, supported to swing through 360°, mounted on casters with locking device.
3. Rear axle overhaul stand.

Testers
1. Coil tester to measure continuity, capacity, and resistance. Tester complete with coil heater and circuit interrupter — for hot and cold tests.
2. Condenser tester to measure continuity, resistance, and capacity of condensers.
3. Distributor tester, portable type complete for static and dynamic tests. For testing point resistance, dwell, mechanispark advance and vacuum advance.
4. Motor tester analyzer, facilities for testing battery, starting voltage and current, cylinder compression, intake vacuum, ignition coil, condenser. Complete with tachometer, dwell meter, volt-amp-resistance and combustion tester.
5. Power light tester. Synchroscope three lead type for making dynamic ign. timing.
6. Spark plug cleaner and tester.
7. Head light tester for adjusting headlight beam.
8. Thermometer tester. Fahrenheit scale glass tube mercury type. Scale 0° to 300° F.

Tire Service
1. Bead expander to compress crown of tire to force beads of tubeless tire against rim.
2. Tire changer with bead breaker and roller.
3. Tire gauge.
4. Tire tester (water tank).
5. Tire repair kit (Tubeless).

Valve Reconditioning Equipment
1. Valve refacer, electric. Motor driven grinding wheel. Universal motor driven valve stem chuck, mounted on adjustable feed base. 9/16" capacity, angle adjustment 30° to 90°, 110 V, 60 cycle motors, bench type.
2. Valve seat grinder, complete with stones for popular car sizes.
3. Valve spring compressor, adjustable for L head engines.
4. Valve spring compressor, adjustable for overhead valve engines.

Welding Unit
1. Portable oxyacetylene welding unit complete with 2 wheel carrier with cylinder holder device. Including: acetylene regulator, oxygen regulator. Torch complete with tips Nos. 0, 1, 2, 3, 4, 6, 8, 10 and cutting attachment. Oxygen and acetylene hoses of 4 ply molded rubber with clamps. Welding goggles, nonmetalic, molded to fit facila contour, eye cups ventilated, adjustable nose band, No. 6, 50mm. safety lens and 50mm. clear protective lens. Fire extinguisher, trigger type, foamite type. (All equip. must be approved by National Board of Underwriters' Lab.)

Wheel Alignment Equipment
1. Test rack with front pit preferred.
2. 3-way alignment gauge set for camber, king pin inclination and caster, including adapter sleeve and clamp to fasten on to spindle. Also turning radius plates.
3. Toe-in gauge.
4. Wheel balancer. Type capable of testing static and dynamic balance of wheel on car.

Brake Assembly
Front and rear.
Complete assembly including wheel, brake cylinder, linkage, and foot pedal for basic instructional unit on brakes. (Order mechanical hand, hydraulic, disc, etc., types which are used on current model cars.)

Carburetors
Current model carburetors used on popular model automobile engines.

Chassis, Automobile
1. Complete chassis with engine, starter, generator, regulator, and ignition system. All warning and electrical devices attached. (Basic instructional element for electrical work of all kinds.)

(Continued on page 102)

AN IMPORTANT NOTICE TO ALL IN INDUSTRIAL EDUCATION

In May, *Industrial Arts and Vocational Education* magazine adds another dimension of service to industrial educators . . . a special issue defining Industrial Education . . . its relation to other areas of education . . . its needs for today . . . its contributions to tomorrow.

Under the penetrating editorship of Dr. John L. Feirer, this special "Administrative" issue acts as a "two-way street"; graphically voicing the thoughts of industrial educators and school administrators on the present and future of Industrial Education . . . exposing the severe pressures placed on it by the Post-Sputnik era and winning school administrators' support by detailing the important "learnings" that only Industrial Education can give to the American student.

For an example of the scope of this Special Report on the "Administration of Industrial Education Programs," here are a few of the articles coming your way in the May issue:

"Why — The Industrial Arts . . . Vocational-Industrial Education: Its Place in the Schools of Tomorrow . . . The Contribution of Industrial Education to the Well-Balanced High School Program . . . What Constitutes Effective I-E Facilities . . . A Guide for Developing I-E Administrative Policy"

Don't miss this Special Report! Alert your friends to this special issue, which is included in every regular subscription!

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Fine Domestic and Imported **WOOD**

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- ☐ Lucite Tubing & Rods
- ☐ Cellulose Acetate
- ☐ Styrofoam
- ☐ Adhesives, Buffing Wheels & Compounds
- ☐ Dyes, Blending Granules, Filling Plaster for Internal Carving
- ☐ Jewelry Findings
- ☐ Fiberglas-Polyester Resins
- ☐ Carving Tools, Drills
- ☐ Tenite II Screw Driver Handle Stock
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- ☐ Plastic Lacing, Cord, Ribbon & Belting

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COPE PLASTICS-ILLINOIS
Dept. A Highway 100 Godfrey, Illinois
"Just Across the Mississippi from St. Louis"

(Lists continued from page 100)

2. Chassis instructional element for front and rear suspension units, power transmission units including wheels and tires.

Differentials
Complete with carrier, axles, and power drive. Order Hotchkiss drive and torque tube types. For assembly and disassembly.

Distributors
Order distributors which are currently used on all popular automobile engines. Complete with distributor head, points, condenser, vacuum advance, automatic advance, and lube fitting (for use as basic training elements).

Engines
1. 6-cylinder overhead valve engine complete with clutch and transmission, ignition and fuel systems, in operating condition.
2. 6-cylinder in line, L head engine complete with clutch and transmission, ignition and fuel systems, in operating condition.
3. 8-cylinder V-type engine complete with clutch, transmission, fuel and ignition systems, in operating condition.
4. Any type cut away engine.
5. Used engines for assembly purposes. To be mounted for dead engine work.

Fuel Pumps
Order fuel pumps used on current engines. Vacuum, mechanical, magnetic, etc.

Generators
1. Order d.c. generators used on current model automotive engines complete with pulley and terminals, 6 and 12 volt types.
2. Order a.c. high output generator with d.c. rectifier and regulator (used on automotive two-way communication circuits).

Ignition Coils
Order coils used on current model automobile engines 6 and 12 volt-types (for basic training elements).

Ignition Condensers
Order condensers used on current model automobile engines (for basic training elements).

Regulators
Order 2 and 3 unit regulators complete with volt, current, and cutout coils. In good operating condition (for basic training element).

Starting Motors
Order starting motor types which are used on current model automobile engines. Order complete with starting switch (manual and automatic) and with engaging mechanisms (Bendix and overrunning clutch).

Steering Gear Assembly
Order steering gear assemblies used on current model automobiles, complete with shifting lever, wheel, arm, column, and shifting link arms (basic training element). Include power steering types.

Transmissions
1. Order conventional transmissions used on current model automobiles.
2. Order automatic type transmissions used on current model automobiles.

furniture

Benches
See section on Special Equipment and Testing Devices.

Bulletin Board

Cabinet
1. Steel supply, 36" x 18" x 72" cabinet, double doors, locking, 4 shelves.
2. First aid cabinet, 5" x 12" x 20" steel for first aid supplies, painted white.

Chalkboard

Desk, Teacher's
5 drawer.

Files
4 drawer, legal size.

Fire Extinguisher
Approved types according to local building and safety codes.

Seating
Provisions should be made for seating class: tablet arm seats are recommended.

Projector
1. 16mm. sound motion picture projector.
2. 35mm. comb. with 2" slide still-projector.

Screen
6' x 8' beaded screen, tripod or wall mtng.

General Shop

woodworking machines

Circular Saw, 10 in.
Including:
1 Motor, 1½ h.p., 3450 r.p.m., single phase, 115/230 v., 60 cycle
1 Extension cord and plug
1 Motor cover
1 Two pole, single phase heavy duty manual switch
1 Cable kit for switch
Accessories:
1 Combination blade, 10 in., ¾ in. arbor hole
1 Cross-cut blade, 10 in., ¾ in. arbor hole
1 Dado head, 13/16 in. capacity, ¾ in. arbor hole
1 Dado insert plate
1 Rip blade, 10 in., ¾ in. arbor hole

Wood Lathes, 2, 12 in.
Including:
2 Motors, ½ h.p., 1725 r.p.m., single phase, 115/230 v.
2 Safety stands
2 Motor hanger assemblies for safety stands
2 2 pole push switches for single phase, 110/220 v.
2 Switch mounting brackets
2 Wiring kits for switches
Accessories:
2 Outboard hand wheels for 12 in. wood lathe
6 3½ in. face plates
2 Screw centers
2 sets of turning tools, 8 tools per set
1 Disk sander, 10 in.
1 Jacobs drill chuck
1 Arbor
1 3-jaw universal chuck, 4 in.
1 4-jaw independent chuck, 4 in.

Band Saw, 10 in.
Including:
1 Motor, ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 2 pole push switch for flush mounting, single phase, 110/220 v.
1 Wiring kit for switch and safety stand
1 Safety stand
Accessories:
1 Miter guage
1 Band saw fence

Jointer, 6 in.
Including:
1 Motor, ¾ h.p., 3450 r.p.m., single phase, 115/230 v.
1 Safety stand
1 2 pole push switch for flush mounting, single phase, 110/220 v.
1 Wiring kit for switch and safety stand

High Speed Drill Press, 15 in.
Including:
1 Motor, ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 Belt guard
Accessories:
1 Drill press lamp
1 Mortising attachment
3 Mortising chisels: (*a*) ¼ x ¼ in.; (*b*) ⅜ x ⅜ in.; (*c*) ½ x ½ in.
3 Mortising chisel bits: (*a*) ¼ x ¼ in.; (*b*) ⅜ x ⅜ in.; (*c*) ½ x ½ in.
1 Set of 6 depth collars, outside diameters: ⅞ in., 15/16 in., 1 in., 1 1/16 in., 1 1/8 in., 1¼ in.
1 Set of 11 shaping cutters
1 Sash and door cutter
1 Shaping attachment
1 Drum sander, 2 9/16 in. dia., 3 in. high
1 Drill press vise
1 Set of 11 router bits
1 Rotary planer
1 Router bit adapter, rotary planer
1 Adapter for 3-wing shaper cutters for drill press

Grinder (Special)
Including:
1 Motor, ½ h.p., 1725 r.p.m.
Floor pedestal
1 Safety eye shield

portable, electric woodworking tools

1 Hand drill electric, ¼ in.
1 Hand sander, reciprocal
2 Portable jig saws
1 Router, hand, ⅞ h.p.; including base, light, wrench, guide, and bit assortment

woodworking hand tools

Awls
2 Scratch

Bits
13 Auger, #4 to #16
3 Dowel, #4, #6, #8
1 Expansive
2 Screwdriver, 3/16 in., ⅜ in.

Braces
3 Ratchet

Brushes
12 Bench duster, 10 in.

(Continued on page 104)

NORTHERN MICHIGAN COLLEGE

1961 SUMMER SESSION

DEPARTMENT OF INDUSTRIAL EDUCATION

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(Lists continued from page 102)

1 Burnisher

Calipers
2 Inside, 6 in.
2 Outside, 6 in.

Carving Tools (Basic Set)

Clamps
14 Adjustable hand: (*a*) 4, #5/0 (4 in.); (*b*) 4, #3/0 (6 in.); (*c*) 4, #0 (8 in.); (*d*) 2, #1 (10 in.)
12 Double bar, 3 ft.

Chisels
13 (*a*) 4, ¼ in.; (*b*) 2, ⅜ in.; (*c*) 2, ½ in.; (*d*) 2, ⅝ in.; (*e*) 1, ¾ in.; (*f*) 2, 1 in.

2 Compass and Wing Divider Combinations

Countersinks
2 For brace
2 For 3-jaw chuck

Drills
2 Hand (¼ in. capacity)
1 Jobbers drill stand, with straight shank high speed steel drills, 1/16 in. to ½ in. by 64ths

Files
3 Mill, 8 in.
2 Round, 8 in.
1 Three-square bastard, 8 in.
2 Second-cut, 8 in.
3 Mill, 10 in.
2 Half-round, 10 in.
1 Round, 10 in.
2 Surform
4 Cards, common wood
14 Handles, #2

Gauges
2 Bit, 2½ in.
4 Marking

Glue Dispensers
2 Plastic, 1 pt.

Hammers
7 Claw: (*a*) 4, 7 oz.; (*b*) 1, 13 oz.; (*c*) 2, 10 oz.

Knives
4 Sloyd, 3 in.
4 Putty, 1¼ x 2 in.

Mallets
2 Wood, 2½ in. face dia.

Nail Sets
6 2 each: 3/64 in., 1/16 in., 3/32 in.

Plane Irons
24 Single

Planes
6 Block, 6 x 1⅝ in.
4 Jack, 14 x 2 in.
2 Router
20 Smoothing, 9 x 2 in.

Pliers
2 Side cutting, 6 in.
4 Slip joint combination, 6 in.

Punches
4 Center: (*a*) 2, 3/32 in.; (*b*) 2, ⅛ in.

Saws
4 Back, 12 in.
1 Compass, 12 in.
2 Crosscut, 1 each: 8 pts., 10 pts.
1 Dovetail
1 Hack, adjustable frame
2 Rip, 5½ pts.

Scrapers
2 Cabinet
6 Hand, blades, 2½ x 5 in.

Screwdrivers
10 (*a*) 2, 1½ in.; (*b*) 3, 3 in.; (*c*) 3, 4 in.; (*d*) 2, 6 in.

2 Spoke Shaves

Squares
2 Bevel, 8 in.
1 Combination, 12 in., with 1 center head and 1 protractor head
2 Steel, 24 x 16 in.
24 Try, 8 in.

Trammel Points
1 3 in.

metalworking machines

2 Metal Lathes

Including:
2 Motors, 1 h.p., 1725 r.p.m.
2 Switches

Accessories:
4 Toolholders: (*a*) 2 straight; (*b*) 1 right; (*c*) 1 left
2 Straight slant cut-off tool holders
1 Offset cut-off tool holder
1 Boring bar holder
1 Knurling tool holder
7 Lathe dogs: (*a*) 2, ½ in.; (*b*) 2, ¾ in.; (*c*) 2, 1 in.; (*d*) 1, 1½ in.
1 Steady rest
1 3-jaw universal chuck
1 4-jaw independent chuck
1 Jacobs drill chuck
1 Arbor for drill chuck
1 Draw-in collet chuck
1 Collet rack
16 Collets, ⅛ in. to 1 1/16 in.
1 Plain taper attachment, mounted on lathe

Vertical Milling Machines

Including:
1 Motor, ½ h.p., 1725 r.p.m.
1 Switch

Accessories:
7 Collets: ⅛ in., 3/16 in., ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.
6 Spiral end mills, ¼ in. dia., r.h.
4 Spiral end mills, ⅜ in. dia., r.h.
4 Spiral end mills, ½ in. dia., r.h.

Sheet Metal Machines
1 Shear, with hold down bar and safety guard, 36 in.
1 Roller, 24 in. width, 20 gauge capacity
1 Box and pan brake, 24 in. width, 16 gauge capacity

Grinder
½ h.p., 3450 r.p.m. motor

Including:
1 Floor pedestal
1 Safety eye shield

Drill Press, 15 in.

Including:
1 Motor, ½ h.p., 1525 r.p.m.
1 Belt guard

Accessories:
1 Drill press vise

metalworking tools

Anvil
1 100 lb.

Anvil Stand
1 #10

Awls
4 Scratch

Buffer
1 ½ h.p. motor, 3450 r.p.m., 115 v.
1 Pedestal, cast iron

Calipers
2 Inside, 6 in.
2 Outside, 6 in.

Cold Chisels
2 Cape, ¼ in.
4 Common, ½ in.

Clamps
10 C clamps: (*a*) 4, Super Jr. Pony; (*b*) 2, 3 in.; (*c*) 2, 5 in.; (*d*) 2, 8 in.
6 Handy spring clamps: 2 each, #1, #2, #3
6 Ring clamps, "B"

Clippers
1 Bolt, 3/8 in. capacity

Countersinks
2 60°, ¼ in. shank

Dapping Die
1 Set, iron
1 Set, punches and cutters, 30 pieces in set

Dividers
4 Wing: 2 each, 4 in. and 8 in.

Dressers
2 Wheel

Drill
1 Hand, ¼ in. capacity

Drills
1 Jobbers drill stand, with straight shank high speed steel drills, 1/16 in. to ½ in. by 64ths

Files
2 Mill bastard, 8 in.
2 Round bastard, 8 in.
2 Half-round bastard, 8 in.
1 Three-square bastard, 8 in.
1 Three-square second-cut, 8 in.
3 Mill bastard, 10 in.
1 Round bastard, 10 in.
2 Half-round bastard, 10 in.
6 File cards, common wood

Foundry
1 Bellows, molders, 8 in.
1 Bulb sponge, 4 oz., with camel hair brush
1 Crucible furnace, including blower, lid, derrick for lifting lid
2 Crucibles, #8
1 Crucible tongs, 17 in.
2 Flasks, steel foundry, 10 x 12 in., 4 in. cope and 4 in. drag
1 Ladle, bottom pour; capacity, 4½ lb. of lead
1 Ladle, melting, 3 in. dia. bowl
2 Lifters, ¼ in. x 12 in.
1 Pyrometer, Lance type, portable, complete with thermocouple
1 Riddle, 18 in. dia., wire screen 16 mesh to the in.
2 Slick and oval spoons, ¾ in.
2 Spoon and gate cutters, 1 in.
2 Trowels, square moulders, 1¼ x 6 in.

Furnace
1 Bench, combination

Gauges
2 Drill point grinding
1 Screw pitch
1 Surface, universal, 3 in. base, 9 x 12 in. spindle
1 Wire — nonferrous
1 Wire — steel

Groovers
3 1 each: #0, #2, #4

Hammers
8 Ball peen: 4 each, 12 oz. and 8 oz.

2 Blacksmith, hand, 40 oz.
4 Chasing
1 Embossing
3 Planishing
3 Riveting, 8 oz.
3 Setting, 12 oz.

Mallets
6 Buckskin fiber
12 Forming and embossing

Pliers
1 Adjustable, "water pump"
1 Curved nose, 5½ in.
2 Diagonal, 6 in.
1 End wire cutters, 10 in.
2 Needle nose, 6 in.
2 Side cutting, 6 in.
2 Slip joint combination, 6 in.

Punches
4 Center: 2 each, 3/32 in. and ⅛ in.
1 Drift, ¼ in.
4 Tinners, hollow: 1 each, ½ in., 5/8 in., ¾ in., 1 in.

Rivet Sets
2 1 each #5 and #8

Rules
2 Steel, 3 in.

Saws
3 Hack, adjustable frame
4 Jewelers, wood handles, adjustable, 6 in. depth and 3½ in. depth, thumbscrew blade clips

Screwdrivers
7 (*a*) 2, 1½ in.; (*b*) 2, 3 in.; (*c*) 2, 4 in.; (*d*) 1, 6 in.
3 Phillips head: 1 each, #1, #2, #3

Screw Plate
1 ⅛ in. to ¼–20, complete with die stock and tap wrench
1 4–36 to ¼–20, N.C. and N.F., complete with die stock and tap wrench

Seamer
1 hand

Shavel
1 Square point, #4

Soldering Coppers
8 4 each, 2 lb. and 1 lb.; including handles

Stakes
1 Blow horn
1 Double seaming
1 Round head
1 Square bevel edge
1 Square common

Stamps
1 Set, metal, ⅛ in. figures

Squares
4 Combination

Tin Snips
1 Aviation
1 Curved, 3 in.
1 Hack bill
4 Straight, 3 in.

Tongs
1 Curved leg blacksmith tongs, 20 in. long, to hold 3/8 in. stock
1 Straight blacksmith tongs, 20 in. long, to hold 3/8 in. stock

Tools
1 Set, backgrounding and decorating, 18 tools to set
1 Set, backgrounding and decorating, "cut B"
1 Set, chasing

Trammel points
1 Set

V-Block
1 Set, Starrett

Welding — Arc Welding
1 100 amp. arc welder, including hand shield with lens, "Selfweld" holder, "Selfweld" electrodes, soldering carbon and adapter

Welding — Gas Welding
1 Torch Wyp tip cleaner
2 Airco spark lighters
1 Renewal flint
1 Combination shipping tool
1 Vise grip welding clamp, adjustable up to 1⅝ in., #9
1 Cylinder truck, for welding tanks

Wrenches
2 Adjustable: 1 each, 8 in. and 12 in.
1 Pipe, straight, 10 in.

electrical tools and equipment

1 Laboratory Magnet Set
1 Wire Cutter and Crimper
1 Continuity Tester
6 Line Testers
2 Fuse Pullers
1 Multimeter
3 Instant Heat Soldering Guns
2 Diagonal Cutting Pliers
2 Long Nose Pliers
1 Long Curved Nose Pliers
1 Electrician's Scissors
1 Nut Driver Set

leather tools

Awls
6 Scratch

Beveler
1 Edge

Boards
12 Cutting
8 Jeweler's rouge

Brushes
6 Glue
4 Dye

Chisels, Thonging
7 4-prong: (*a*) 6, 3/32 in.; (*b*) 1, ⅛ in.
4 1-prong: (*a*) 3, 3/32 in.; (*b*) 1, ⅛ in.

Creasers, Edge
2 1 each, #1 and #4

Dividers
1 6 in.

Edge Tool
1 Common, #5

4 Fids
Knives
10 Bevel point

Marble Slab
12 1 in. thick

Markers
2 space: 1 each, 5 and 7 stitches

Modelers
3 Ball-end
3 Deerfoot
12 #4771

Mallets
6 Hickory or rawhide

Punches
2 Revolving, 6 tube

Needles
1 package, Glover's
24 Lacing

Set
1 For attaching snap buttons

Setters
2 Eyelet

Squares
10 Steel, 12 x 1 x 7 x 1 in.

8 Tracers

drawing tools and equipment

1 Pencil Pointer

Pencil Sharpener
1 Draftsman's point

Print Machine
1 Moist process, using Diazo paper, including stand

T Squares
24 Professional quality, 18 in., maple blade and head

copper enameling tools and equipment

1 Atomizer
6 Brushes, artist #2
2 Forks
1 Hot plate, electric
1 Kiln; chamber size 8½ x 8½ x 4 in.; including: pyrometer, pilot light, and input control switch
4 Knives, artist pallet
1 Rack, firing
1 Sieve, 80 mesh
4 Spatulas
4 Tweezers

general craft tools

Heater
1 Plastic strip, 21 in.

Pliers
1 Set of 5, jewelers

Saw, Circular
1 For plastics, 10 in. dia., ¾ in. arbor hole

1 Vibro-Tool Kit
Woodburning Sets
2 Complete

Heating Elements
2 Replacement, for woodburning tools

general tools and equipment

1 Blackboard Compass

1 Blackboard Set

Oil Cans
10 ½ pint, 6 in.

Air Hoses
2 25 foot, with nipples and couplers
3 Sherman air nozzles

Waste Cans
2 For oily rags, 10 gal., with foot lever

(Concluded on page 106)

(Lists concluded from page 103)

Spray Booth

Leg type paint arrestor; 3 ft. wide inside, 4 ft. high inside, 3 ft. 6 in. working depth, 5 ft. 2 in. overall depth. Complete with paint arrestor filter bank, 24 paint arrestor filter pads, manometer, exhaust fan, exhaust duct, exhaust fan motor

Spray Equipment

1 PHLE-501, air condenser and regulator
1 PJGA-502, #30 EX spray gun
1 PKR-550, 1 quart suction feed cup
1 Air hose: 8 ft., 5/16 in. i.d., with PHC-4527 connection on one end and HC-4511 quick detachable connection on the other end
2 PHC-4416, quick detachable stem
1 PDGB-501, air dusting gun
1 PTGA-501, #90 F spray gun for touch-up
1 PC-538, 6 oz. metal cup attachment
1 AD-404, adapter for cup
1 PHC-4416, quick detachable stem

general shop machine motor specifications

Woodworking Machines

1 Circular saw, 10 in.
Motor: 1½ h.p., 3450 r.p.m., single phase, 115/230 v.
1 Band saw (wood)
Motor: ½ h.p., 1725 r.p.m., single phase, 115/230 v.
2 Wood lathes
Motors: ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 Jointer, 6 in.
Motor: ¾ h.p., 3450 r.p.m., single phase, 115/230 v.
1 Drill press (bench type)
Motor: ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 Grinder, pedestal type
Motor: ⅓ h.p., 1725 r.p.m., single phase, 115/230 v.

Metalworking Machines

2 Lathes (metal)
Motors: 1 h.p., 1725 r.p.m., single phase, 115/230 v.
1 Vertical mill
Motor: ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 Drill press (bench type)
Motor: ½ h.p., 1725 r.p.m., single phase, 115/230 v.
1 Grinder, pedestal type
Motor: ½ h.p., 3450 r.p.m., single phase, 115/230 v.
1 Band saw (cut off)
Motor: ⅓ h.p., 1725 r.p.m., single phase, 115/230 v.
2 Buffers
Motors: ½ h.p., 3450 r.p.m., single phase, 115/230 v.

Portable Tools

2 Jig saws
Motors: ⅓ h.p., 110 v.
1 Reciprocating sander
Motor: ⅙ h.p., 110 v.
1 Hand drill
Motor: ⅙ h.p., 110 v.
1 Saber saw
Motor: ⅙ h.p., 110 v.
1 Router
Motor: ⅞ h.p., 110 v.
1 Kiln, 15 amp., 115 v.

power mechanics motors

Motor, vertical power, outboard, 5 h.p., two-stroke cycle, display cutaway
Motor, horizontal power, utility, 2.5 h.p., four-stroke cycle
Motor, vertical power, lawnmower, 1.5 h.p., two-stroke cycle, display cutaway

cabinets

2 General Storage Cabinets
4 Units — Student Work Center Cabinets
Including:
6 seats and 6 drawing boards to a unit, with combination vise and storage space for each student

1 Moulding Bench
9 Auxiliary Work Benches
2 Finishing room
1 Woodworking
6 Metal area

1 Welding Bench
1 Sheetmetal Bench
1 Wardrobe and General Storage Cabinet
1 Hand Woodworking Tool Cabinet
1 Hand Metalworking Tool Cabinet
1 Chalkboard Assembly
1 Case for Illustrative Materials and References
1 Demonstration Bench
1 Portable Work Counter
1 Electrical Test Bench
1 Wash-up Sink
1 Leather and Plastics Bench
1 Glue and Clamp Bench
1 Teacher's Desk
1 Teacher's Chair (Desk)
24 Tablet Arm Chairs

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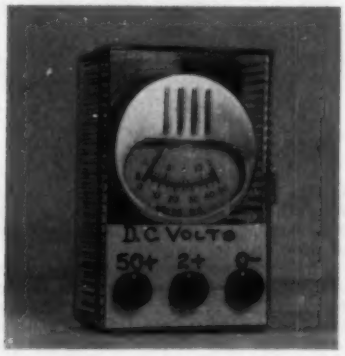
A convenient pocket tester, which has no attached lead wires to tangle and break, can easily be made by mounting an inexpensive 2 in. diameter double scale battery tester in one of the small transparent boxes with snap lid that can be obtained from most variety stores.

The battery tester which I bought had



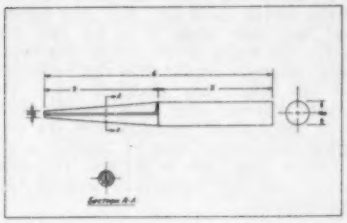
three test leads; these I trimmed short and soldered them to the lugs of three small tip jacks — two red ones for the positive lead and a black one for the common negative. To keep the tester in position, I cut a piece of ⅛ in. thick hardboard to slip just inside the box and attached three clips to the hardboard so the tester could be snapped firmly in place. I then drilled holes in the lid to clamp the tip jacks in position and with them clamped, inside the transparent cover, a card to indicate the proper connections for the tester, which for mine is, 50+, 2+, and 0—, thus enabling any d.c. volts from 50 volts down to be measured. Any standard test leads will fit these test jacks.

For continuity tests on radios, flat irons, cords, toasters, experimental hook-ups, etc., use a common 1½-volt flash light cell in series with the leads. Always disconnect whatever you are working on from the power line before testing the circuit. ◀

George P. Pearce, Albuquerque, N. Mex.

SOLDER FORM

Issuing solder with as little waste as possible presents a problem for anyone who supervises an area where a quantity of solder is used, such as electrical or electronic laboratories. If solder is used directly from the spool or box it is quite a bulky item to handle while doing precision soldering on electronic gear. If solder is cut up



into short lengths, such as six to eight in., there is a tremendous waste problem.

To eliminate this waste and inconvenience a method that has been tried and proved itself very well is to make a simple form from a piece of 5/16-in. dowel rod. The waste that can be eliminated has been estimated to be as much as one in. for every six or eight in. of solder if issued in short lengths. Based upon the six in. lengths this form could provide a savings of six in. for every three and one-half ft., which is contained in one formed coil; therefore, the waste will be cut by approximately 85 per cent. In addition to the savings realized by this method, it is more convenient to have at the fingertips an adequate supply of solder for any job that might be done while having the solder in this conical shape fits the hand very nicely when soldering.

By using this form, it is possible to wind about three or four ft. of solder into a conical shape with the end protruding through the center of the cone. As solder is used the end is pulled and it will unwind itself inside the formed cone.

The procedure to make the form is as follows:

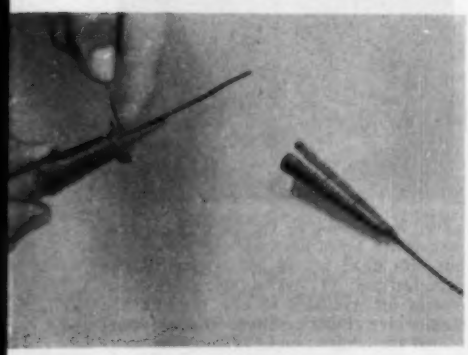
1. Turn a taper on the dowel, this may be accomplished on a lathe or sanded to the dimension on a disc or belt sander.
2. Cut a small groove in the tapered portion to accept the diameter of solder that is being used in your laboratory.

The coil of solder is formed by placing a six in. length of solder in the groove on the form and start winding from the large end of the taper to the small end. After the coil is formed, remove it from the form. A more economical and convenient method of soldering will be the result. ◀

R. H. Berry, Instructor of Industrial Technology, Purdue University, Lafayette, Ind.

HOW TO INJECT INDUSTRIAL METHODS

In order to familiarize my students with some of the ways of industry, I have installed a system of checking in and out of the shop. The students simply take their assigned number from the "out" side of the panel and place it on the "in" side when they enter the shop. When leaving, they reverse the procedure. I also use this system for roll call. It saves a great deal of time for everyone.



I have found that this checking-in-and-out system curtails the student's desire to leave the shop in a great hurry. When the students have finished cleaning up, they stand in a line while the shop foreman and I check the shop for cleanliness and order. Whenever we find something out of order, the first person in line has to make it right. When he has finished, he must return to the end of the line. As you can guess, this

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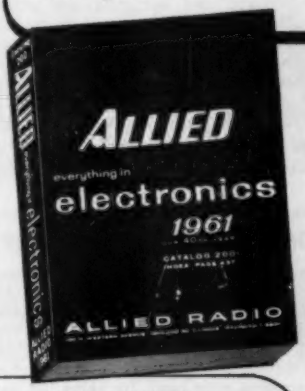

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is an excellent method for keeping the shop clean and for discouraging laziness in cleaning up. The students soon develop the habit of checking on and helping each other.

Another "touch of industry" is the safety sign that I have installed. The sign has a safety slogan and our past and present safety record. The hours spent in the shop without an accident are changed at the end of each week to correspond with the actual number of hours spent in industrial arts. This sign has done much to encourage safety.

John Oakeson, principal and industrial arts instructor, Holcombe, Wis.

SIMPLIFIED FIGURING OF FRACTIONAL DIMENSIONS

In the process of using fractional dimensions in technical work, the reducing of certain mixed numbers by one half (those involving odd whole numbers) is a constant source of irritation to many persons. The method described here is thought to be the simplest ever used. Its value lies in its simplicity and complete freedom from any involved mathematical computations.

Suppose we wish to find one half of 7 and $17/32$. The usual procedure is: (1) divide the whole number by 2, write down the 3, and mentally note the ½ remainder; (2) divide the existing fraction by 2, obtaining $17/64$; (3) convert the ½ remainder to a fraction having the same denominator as the new fraction, thus $32/64$; (4) add the remainder to the new fraction; $32/64$ plus $17/64$ equals $49/64$, and (5) add this fraction to the 3; thus we obtain 3 and $49/64$ as the final result.

Using the simplified method we (1) divide the whole number by 2, writing down the 3 as before, but discard the ½ remainder; (2) add the denominator and the numerator of the existing fraction, 32 plus 17 equals 49. This sum now becomes the numerator of the desired term; (3) the denominator of the desired term is simply twice the existing denominator, or 32×2 equals 64, and (4) add this fraction to the 3, thus obtaining 3 and $49/64$.

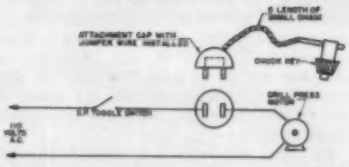
The mathematical justification of this system is based upon the fact that the denominator of the existing fraction is always equal to the numerator of the ½ remainder (after it has been converted, as in Step 3 of the usual procedure). This occurs because the denominators of fractions used in technical work are all multiples of the number 2.

James H. Cadagin, Pekin, Ill., Community High School

A DRILL PRESS SAFETY KEY

Many of us have experienced the young shop student who "forgot" and left the chuck key in the drill press chuck. When the unwary student turned the machine on, the key became a missile.

To eliminate this problem forever (as well as to keep the chuck key always in its place), this writer designed this electrical control chuck key. Any shop instructor can easily adapt it to his own drill press. The wiring is very simple. The switch and receptacle combination can be bought in just about any electrical store. The wiring is merely series. However, to comply with the national electrical code, the electrical components must be inserted in the black or "hot" side of the line. The white wire must be continuous without any interruption.



The writer has shop tested this safety device for about three years and has found that it is a real asset toward the goal of safety. It is his hope that others will adapt it to their drill press and prevent their chuck keys from "taking off"!

Robert J. Mouser, instructor of electricity, Neshaminy High School, Langhorne, Pa.

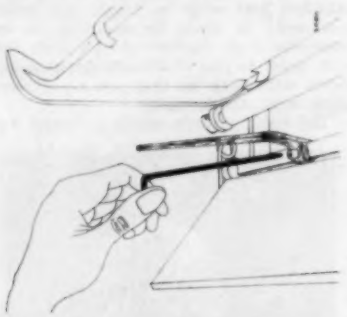
SIMPLE TOOL FOR PILOT PRESS GRIPPERS

Anyone who has had experience operating certain makes of pilot printing presses is aware of the difficulties encountered whenever it becomes necessary to move the grippers. It is especially cumbersome to reach the thumb screws underneath when the grippers are located near the rocker or other parts of the press. Their movement can be made quite easily and simply in an upright position without fumbling and getting the hands oily and soiled by performing a few machine shop operations.

The following steps are quite simple and can be accomplished in most metal shops within the school:

1. Remove the gripper bar and grippers from the press.
2. Remove and discard the thumb screws that are furnished with the grippers.
3. Drill a $13/64$ hole on the base of each gripper. Make certain this hole is centered over the gripper bar.
4. Tap holes with a ¼ — 20 N.C. thread tap.
5. Insert a ¼ × ¾ — 20 N.C. Allen flat point set screw in each gripper.
6. Cut a ½ in. piece from a ⅛ Allen hex key. (Hex measurement is across flats.)
7. Weld this ½ in. piece to a $5/16$ round or square steel 8 in. long. Finish welded area off smoothly. If an 8 in. piece of ⅛ hex steel can be secured it will save the welding and finishing operation.
8. Measure 1 in. from the end of the rod and bend to a 90 degree angle, this will serve as a handle for the tool. It is suggested that complete adherence to the length of this handle be made, since a longer handle will give the tool too much leverage and may cause rounding of the screw socket or key.

In the event the Allen key becomes slightly rounded and slips in the screw,



all that is necessary is to grind the rounded end off, and the tool will be as good as new again. The writer found it necessary to grind the tool only once in six years.

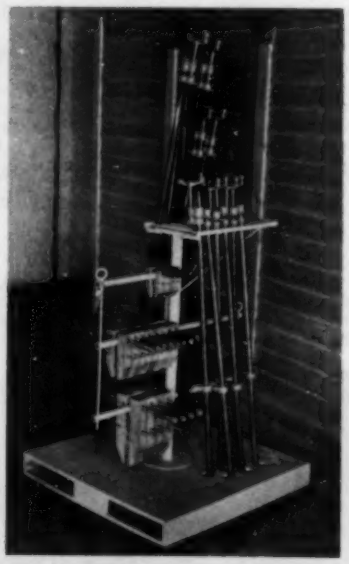
The time spent in making this simple tool will more than pay for itself in time saved in moving grippers, the washing of soiled hands, and the prevention of smashed forms. The use of this easy-to-use tool tightens the grippers more securely than the often inaccessible thumb screws.

Nicholas D. Germano, Graphic Arts Instructor, Balboa High School, San Francisco, Calif.

PORTABLE CLAMP RACK

Having clamps available where they are needed and storing them in a minimum of space can produce some problems for the industrial arts teacher.

The clamp storage problem has been



solved in our shop by the use of a portable rack which holds not only the bar clamps but also hand screws and c clamps. The rack features: (1) portability, so that the clamps are available at any place in the shop where gluing or other clamping operations are needed; and (2) complete secu-

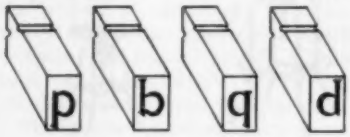
rity in that the rack may be locked if necessary.

The size of the rack may vary according to local needs; however, the writer found that a three ft. square base made from ¾ in. plywood and the "tree" of a height sufficient to support the longest bar clamps, to keep them from becoming entangled, allows room for most clamps necessary in a smaller wood shop or in a general shop program.

Marvin E. Douty, Industrial Arts Instructor, West Grand County Schools, Kremmling, Colo.

BEST PRINTERS DECIDE QUICKLY

The four demons — b, p, d, and q — are most confusing to the beginning graphic arts pupil. Most illustrations will always



b p d q

list them alphabetically. I use the simple phrase, "Best Printers Decide Quickly." Here the first two letter are reversed as well as the last two. By making sure the nick is up, and knowing the phrase, the beginner will solve one of his most difficult problems.

MARKED TYPE CASES

In order to keep type cases in their proper order, paint a stripe diagonally across the cases. Each case can also be numbered on this stripe. A different color is used for each type cabinet. As an aid in keeping the cases clean, all cabinets are locked until the cases are needed. A wooden stick, painted the same color as the stripe, fits into a U shaped bottom clamp and T

shaped top clamp. A master key fits all the locks, also painted the color of the stripe.

The lock, of course, is not unbreakable, but it is used as a means to keep the cases clean by keeping out pupils who should not be using these cases. It is very effective, especially with pupils who are new to the shop and find that Century Schoolbook or Century Schoolbook Bold or even Century Schoolbook Italic seem the same.

Denham R. Griffin, Nichols Junior High School, Mount Vernon, N. Y.

VISUAL AID FOR WOOD IDENTIFICATION

As most woodworking instructors know, learning to identify woods is a difficult and time consuming task for nearly every student. A lecture on how to identify woods is not enough. To teach it effectively, a visual aid should be placed in a location where students will make reference to it freely and frequently. A display, of samples from wood stocked in the shop, placed near the lumber storage rack will attract student attention. Students will refer to it frequently when selecting and getting out stock for projects.

The type of visual aid shown in the photo is portable and flexible. It may be

removed from the room when testing wood identification. The student may turn the samples over, with the names to the wall, and mentally quiz himself. The samples may be added to or placed in different order by restringing.

To construct this visual aid use ½-in. solid stock. Stock ¾-in. thick is a little heavy, but will work as well. Cut all samples to 3-in. width and 10-in. length. Sand all surfaces especially well on the end grain. Letter on names with felt tip marking pen and leave unfinished. Drill, countersink, and string with nylon plastic cord.

Patrick Spielman, Instructor, Industrial Arts, Gibraltar High School, Fish Creek, Wis.

A COLOR CODE FOR THE FINISH ROOM

We often have the trouble in our finish rooms of keeping the various finishes in the correct order, brushes in the liquid in which they belong, and so on. Here is a method of helping to keep students on the right track. It is not foolproof, and should not be left to function by itself. If handled conscientiously, it will aid in the correct steps of application and in keeping incompatible finishes separated.

The problem was solved by making a color-coded chart on 22 by 28 in. poster board. The chart was divided into two sections, one for first coats and one for finish-type coats. The names of the

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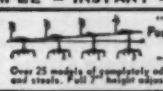

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various finishes and their solvents were each given a separate color code. Tempera paints were used for the codes and India ink was used for the body of the directions. The colors are not only eye-catching, but also add a splash of color to sometimes drab surroundings. The charts were mounted on masonite and plastic tape used for a border and to

SET retains original color and grain, use first.
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SHELLAC should be used as a first coat.
DEFT may be used as an all-in-one finish, put on at least two coats ... often three.
ALCOHOL is used to thin or to clean both SHELLAC and DEFT.
VARNISH, PAINT ... ENAMEL are finish coats; seal with SHELLAC first.
TURPENTINE is the solvent for VARNISH, PAINT and ENAMEL.

hold them together. It is recommended that the charts be given a coat of plastic-type spray preservative.

Certain aspects of this idea are applicable to any type of finish situation. You can also use numbers, tape, or other method in place of the color code. The time spent on this chart will soon be returned in time saved on the job and a more orderly finish room.

G. Lee Farber, Hastings Junior High School, Hastings, Neb.

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It's surprising the number of ways you and your students will find to use castings of this type. We have used them as the

illustrations portray and as decorations on lamps and book ends. They have never failed to stimulate interest in the foundry area or to keep this area a fresh and changing activity.

The size of your pattern is restricted by the size of your flask. Trace the pattern of your choice on ⅛-in. hardboard which is then cut out on the jig saw.

To insure a uniform bevel for the draft, draw a guide line ⅛ in. in from, and parallel to all edges. On outside edges file the bevel, on hard to reach inside edges cut the bevel with a sharp pen knife. Sand all edges and you are ready for a casting.

James H. Arvanites, Industrial Arts Department, Memorial Junior High High, Middletown, N. Y.

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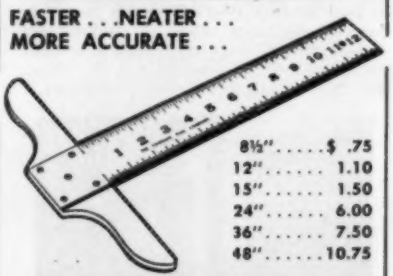

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MANAGING SUPPLIES

(Concluded from page 60)

not afford to pay for their supplies, this might be an acceptable and desirable practice. Probably the chief method used to finance supplies is to have the student pay for all materials used. Two other commonly accepted practices are to have the student pay for materials used plus a shop fee for incidental items, and to have students pay for all supplies over a minimum allowance. These funds are normally collected before the project is completed; however, depending upon the method used, funds are also collected at the beginning of the course, and at the time the project is completed. It is considered wise under most circumstances to make sure that all student material costs are cleared before the project is allowed to be removed from the shop.

The inherent character of administration in all types of endeavor necessitates the keeping of records. Not only is record keeping a necessity, but it is also an effective educational device.

Financial records include many things such as budget estimates, appropriations for supply items, and income from shop fees and materials sold to students. Materials records should show information such as amounts and kinds purchased and sold, amounts on hand at frequent intervals, dates purchased, from whom purchased, and the cost. In addition to these permanent type records, there is usually need for temporary records such as material bills or requisitions made by students for their individual projects, records of payments and balances due from students for material, and duplicate receipts showing money collected or refunded to students. Much of the data appearing in permanent records is based upon items in temporary records, hence it is extremely important that they be handled with as much concern for accuracy as are the permanent records.

As one of the forms used for record keeping and accounting mentioned in this article, the inventory possibly deserves special attention. A complete and exhaustive inventory should be made periodically. This entails considerable work and expenditure of time on the part of the teacher, and may not be justifiable if done too frequently. The perpetual inventory appears to provide a better instant supply picture, and can always be supplemented with the periodic inventory as needed.

Methods and forms used to keep a continuous inventory of supplies vary widely because of the wide differences existing among schools of different sizes. However, by careful study of his local requirements, any teacher can devise a workable plan of showing at all times: (1) the amount of any type of supplies on hand at the beginning of an instructional period, (2) the amount issued during each shop period, and (3) the amount remaining in the stock room on any given date. One satisfactory scheme is to post a large sheet on the inside of the storeroom which gives on the top line the total amount of a particular item at the beginning of the instructional period, its unit cost, its total cost, and the date of purchase. Succeeding lines provide space for the name of the student withdrawing the material, the date of withdrawal, amount withdrawn, its value, and, by subtraction, the quantity remaining after each withdrawal. This plan is relatively simple, takes little time to keep in order, and shows immediately both the amount on hand and its value at any given time during the year.

In Conclusion

Since any expenditure of educational funds can be justified only in terms of the educational benefits derived therefrom, it becomes increasingly imperative that only sound methods of selecting, purchasing, issuing, financing, and accounting for industrial education supplies be used.

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INVENTORY CONTROL

(Concluded from page 63)

dent planning and problem solving. So much for individual records.

Avoiding Waste

Reason and understanding, plus constant kind survey, gets boys on the instructor's side, and if he is successful in getting the point across that waste costs *everybody*, he'll get good co-operation. With the best student leadership . . . you still have to keep personal watch and make frequent open checks to keep your lads on their toes. Human nature being what it is, you are going to have to make some allowances and charge enough for supplies, above what you pay for them, to make up for "breakage," petty stealing, and youthful forgetfulness.

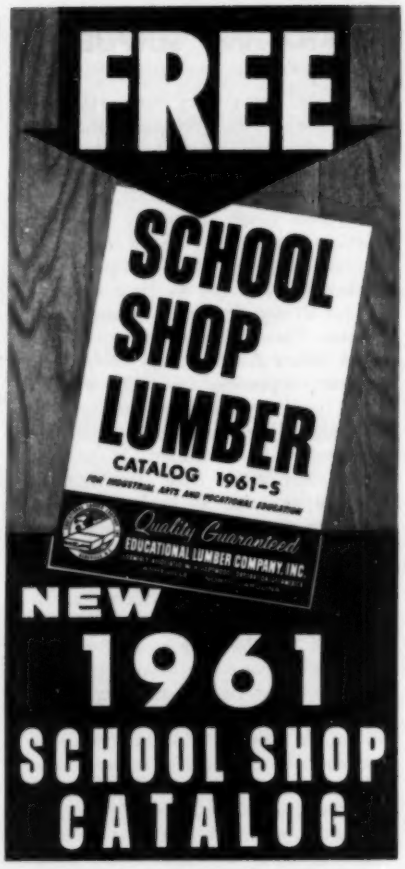
Inventory Checking

Checking your supplies by inventory at frequent intervals isn't as difficult as you might think. A card file, alphabetized by item, distributor, stock number, and cost, on all items of supply is helpful. By frequent check, you can tell how much material from so-and-so company you have purchased, how much it cost you, and thus, using these cards keeps reasonable check. These cards make ordering easier, end-of-school-year book-balancing less tedious, and presents a most business like approach to materials inventory. The point is, that it is necessary for you to *have the list in some form* so you can readily have some guide to follow when adding it all up.

Tools and Machines

Tools and machines are not quite as troublesome, but to some men, presents an endless countermatch with students. Again, this appears simple to avoid, and I hesitate to touch on it, as I have seen endless fine articles in IA/VE with pictures and diagrams relating to tool panels.

It appears to this writer that tool losses and the problems associated with them can be reduced to this statement: *If tools are given a set place, bracketed, backgrounded, labeled and numbered* (to show how many rules, try or "T" squares are supposed to be hanging there) *and student foremen made responsible to see they are there at the beginning and end of each period*, there are little, if no losses. And *if* lost, the period (and the students involved) can be pin-pointed for payment (or if you have a faint heart) made to *think* they will have to pay for the missing item. Again, the card system is a good one . . . leading off with: AWLS, Scratch and manufacturer, distributor, number, date and cost. ◀



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FLORIDA INDUSTRIAL ARTS ASSOCIATION

District IV conducted its first meeting in Miami on December 2–3 at the Dade County Junior College.

Dr. Kenneth Williams, president, addressed the group on "How the Junior College Correlates Teacher Training with Senior College Programs."

Thomas Carter, chairman of technical division, spoke on "The Explanation of the Technical Division."

Dr. Ralph Steeb, state consultant, presented his views on "Problems Confronting the Industrial Arts Teacher."

On the second day a panel of architects discussed and displayed the latest trends in architectural drafting techniques and materials.

District III — Central Florida — held their meeting in the Industrial Arts Department of Florida Southern College at Lakeland, on January 14.

Demonstrations in power mechanics, leather, fiberglas, and photography were conducted by James Paige, Wallace Ryan, Bill McNeil, and Ed Sincic, respectively.

District II and I. The Jacksonville District II meeting is being planned for April 14. The theme is to correlate science and industrial arts.

District I conducted a two-day meeting on February 17 and 18 at Florida State University at Tallahassee. Mr. Ed Kenyon is District Vice-President, and Dr. Hugh Hinely co-ordinated the program.

Troy Cumming, Mulberry, Fla., High School, is president of the Florida Industrial Arts Association.

NEW YORK STATE STEERING COMMITTEE FOR INDUSTRIAL ARTS

The New York State Steering Committee for Industrial Arts, composed of thirty-seven regional teachers' study clubs, has as its officers: Chairman, William S. Barnes, Syracuse, N. Y.; Vice-Chairman, Jack C. Brueckman, Jr., West Seneca, N. Y.; Secretary, James R. Crawford, Central Valley, N. Y.; and Treasurer, Arnold Naroff, Fresh Meadows, N. Y.

COMING CONVENTIONS

Mar. 2–4. Illinois Vocational Association, at Chase-Park Plaza Hotel and Convention Hall, Asbury Park, N. J. Secretary, C. E. Summerville, 103 North Lynn St., Champaign, Ill.

Mar. 9–11. New Jersey Vocational and Arts Association, at Berkeley-Carteret Hotel and Convention Hall, Asbury Park, N. J. Secretary, Richard O. Harthmann, 236 Lexington Ave., Jersey City, N. J.

Mar. 17–18. California Industrial Education Association, at Fairgrounds, Fresno, Calif. General chairman, Robert P. Hansler, director of industrial education, Fresno City Schools, Fresno, Calif.

Mar. 23–25. Ohio Industrial Arts Association, at Neil House, Columbus, Ohio. Secretary, Robert Boyer, 7463 Midland Rd., Cleveland 31, Ohio.

Apr. 5–7. American Industrial Arts Association, at St. Louis, Mo. Program chairman, Robert Swanson, Stout State College, Menomonie, Wis.

Apr. 6–8. Indiana Industrial Education Association, at Sheraton Hotel, French Lick, Ind.

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personal

appointments . . .

▸ *Herbert Siegel* is director of industrial arts for New York City. Over 200,000 students are presently enrolled in industrial arts classes in this city, and the teaching staff runs well over 1000 in all divisions. He was former chairman of industrial arts at John Jay High School in Brooklyn.

Mr. Siegel was graduated from Brooklyn Technical High School in 1936. He received his Bachelor of Science degree from Oswego State Teachers College, and earned his Master of Arts degree at New York University. He has completed many hours of credit towards his doctorate at Columbia University. He has been active for many years in the recruitment of industrial arts teachers for this city.

Herbert Siegel

In 1958 he was honored by the Brooklyn Guild of Industrial Arts Teachers by being voted "MUG" of the year for outstanding service and contributions to Industrial Arts education, and in 1959 Mr. Siegel was cited by the New York City Council of Administrators and Supervisors of Vocational and Practical Arts Education for his work in arranging joint meetings for industrialists and educators, so that common educational interests could be explored.

He is a charter member of Epsilon Pi Tau, national honorary fraternity and all of the Industrial Arts professional organizations. In addition to his educational background he has spent many years working in industry to better prepare for this important position in the New York City School System.

▸ *Dr. John Fuzak,* professor of teacher education at Michigan State University, Lansing, has been appointed assistant dean of their College of Education. He plans to continue work in industrial education with doctoral students and assist with summer session classes.

After having served as vice-president (1954–57), Dr. Fuzak has been president since 1957 of the American Council on Industrial Arts Teacher Education. In 1953 and 1955 he was winner of the Distinguished Teacher Award for the College of Education at Michigan State University and in 1958 he won the first place award given by the American Technical Society for significant research.

▸ *Professor Melvin Betterley,* promoted to the position of head of the Engineering Drawing Department at the State University of Iowa, at Iowa City. He holds a B.S. degree from Stout, and an M.A. from the University of Minnesota.

Mr. Betterley joined the staff of the Iowa University in 1952 as assistant professor of technical drawing in the Engineering Department. Several years ago he was promoted to full professor in this department. Previous to joining the Iowa University, he held positions at Minot State Teachers College, N. Dak., and the Illinois Institute of Technology at Chicago.

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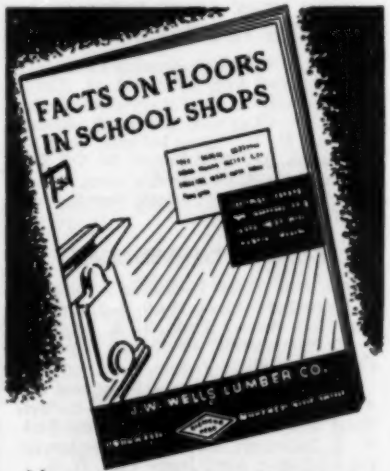

New, reliable, useful now, this is a summary of reports from superintendents of 57 major school districts on the kinds of floors they now have — floors they prefer, — for each of 8 major shop areas, woodworking, metalworking, printing, etc. (Survey made by Industrial Arts & Vocational Education Magazine, 1959.)

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▸ *Dr. Walter B. Jones,* director of vocational teacher education department, School of Education, returned to his position at the University of Pennsylvania, Philadelphia, after a two-year leave of absence from the University to serve as educational consultant with the OEC-EPA. His work was concentrated largely in Italy and in Greece where he assisted in the establishment of Vocational Teacher Education Training Technical Institutes. Special consultations were made to Yugoslavia, Turkey, and Ireland during his period of service abroad.

▸ *Dr. Leon P. Minear,* formerly principal of Benson Polytechnic High School, Portland, Ore., as state superintendent of public instruction, replacing Dr. Rex Putnam, whose resignation took place on January 31.

Dr. Minear became principal of Benson Tech in 1952 after serving three years as president of Stockton Junior College. He is chairman of the Curriculum Commission of the Oregon Association of Secondary School Principals, member of the High School-College Relations Committee, member of the executive committee of the Oregon Association of Secondary School Principals, and chairman of the Portland Metropolitan Youth Commission.

He is a native Texan, and an honor graduate of San Francisco State College. He holds both master of arts and doctor of education degrees from Stanford University. He began his teaching experience as a traveling instrumental music teacher in the elementary and junior high schools of Oakland, Calif., and later taught music in the Lockwood elementary and junior high schools and Oakland Technical High School. While completing graduate work at Stanford, he was vice-principal at Carmel-By-The-Sea High School. After receiving his doctor's degree he went to the University of Denver where he was associate professor of education.

Dr. Minear is the twelfth superintendent of public instruction since the office was created in 1873.

deaths . . .

▸ *Robert E. Smith,* associate professor of industrial arts at Central Missouri State College, Warrensburg, since 1936, died on December 19, 1960, at Boone County Hospital, Columbia.

Robert E. Smith

Mr. Smith had an active interest in teaching and supervising, and for many years was sponsor of Alpha Phi Omega Scout fraternity, and of the district Boy Scouts of America. He supervised in the Laboratory School and taught classes in woodwork and crafts for elementary schools.

▸ *George E. Myers,* professor emeritus of the University of Michigan, died January 9 while attending the White House Conference on Aging, Washington.

A professor of vocational education and guidance, Professor Myers served 24 years as a U-M faculty member prior to his retirement in 1942. He organized the U-M Department of Industrial Education, now the Department of Vocation Education in the School of Education.

Professor Myers received his A.B. degree at Ottawa (Kans.), University, in 1896, his A.M. at the University of Chicago in 1901, and his Ph.D. at Clark University in 1906.

He served as principal of Colorado Springs High School and was supervisor of vocational education for the New York City Schools prior to his appointment at the U-M in 1917. In 1931 he was president of the National Vocational Guidance Association, and for several years served as associate editor of its official publication.

He formerly served as chairman of the Advisory Committee of the U-M Bureau of Appointments and Occupational Information and as a member of the University Council's Committee on Public Relations. He had memberships in the NEA, the National Society for Vocational Education, and Phi Delta Kappa.

▸ *Dr. John A. Lapp,* educator, labor arbitrator, and former civic leader in Chicago, died December 30, 1960. He was 80 years old.

He joined the faculty of Indiana University in 1911 as an instructor in sociology. In 1914 he was named by President Wilson to the National Commission on Vocational Education. He served as director of research for vocational education for Indiana and was author of *Learning to Earn,* a basic text in trade-school studies.

From 1926 to 1932, Dr. Lapp was professor of sociology at Marquette University, Milwaukee, where he wrote several high school textbooks in civics and sociology. He was instrumental in organizing the Washburne and the Dunbar Trade Schools in Chicago.

retirements . . .

▸ *Alfred C. Lamb,* retiring as architect and director of building services for Wayne State University, Detroit. Prior to his arrival at that university in 1938, he had worked with Walter P. Chrysler to develop production techniques for building Liberty airplane engines in World War I, served in the signal corps during that war, designed vocational education rooms for Detroit's first junior high schools, organized the board of education business office, and the school-maintenance program for Hamtramck, Mich., and directed construction of classroom buildings and Keyworth stadium in the Detroit area. Prior to and during his early work in construction and maintenance, Mr. Lamb taught in the public schools of Nebraska and Wisconsin, and later in the schools of Detroit and Flint, Mich. During World War II his volunteer teaching of civil defense instructors won for him a special commendation from the Detroit office of Civilian Defense.

Mr. Lamb received his diploma from Stout at Menomonie, Wis., in 1941, and his bachelor's degree in 1924. Upon retirement he will join his son in private business as consultants in buildings and grounds for school systems throughout the nation.

▸ *Dr. Rex Putnam,* Oregon state superintendent of public instruction since 1937, has resigned from office effective January 31, 1961. His decision to resign was conditioned by his health.

Dr. Putnam was appointed superintendent of public instruction on September 1, 1937, by Gov. Charles H. Martin, and was elected to the office on November 8, 1938, and has been re-elected five times. The office was made non-partisan in 1939. His present term would have ended December 31, 1962.

The position of superintendent is being filled by Dr. Leon P. Minear, former principal of Benson Polytechnic High School, Portland.

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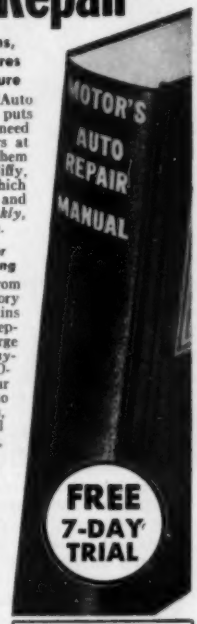

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(For further details encircle index code 0301)

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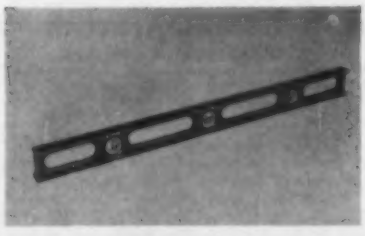

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(For further details encircle index code 0302)

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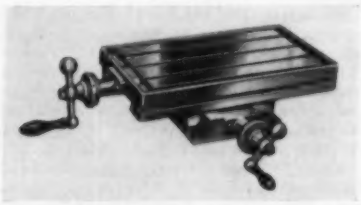

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surface is 22½ by 9½ in., fitted with two T-slots, perimeter coolant trough, and a third T-slot in the front vertical table surface. The new milling table can be used interchangeably on Boice-Crane 18-in., 24-in., and new 25½-in. geared-head drill presses, and adapts to any press with table-knee bored 2⅜ in. Further described in an illustrated brochure.

(For further details encircle index code 0303)

semi-automatic U. S. duplex half-mill From U. S. Burke Machine Tool Company, and of particular interest to teachers of industrial and technical education, the U. S. Duplex Half-Mill squares both sides of three ½-in. thick steel plates simultaneously, in production lots. Variations of this highly flexible duplex unit can perform slotting, sawing, keyway cutting, face milling, slab milling, boring, and a variety of other operations. The new machine achieves its specialized purpose through a combination of basic units, and incorporates two standard No. 40 taper spindle heads, standard cross slides, and a standard hydraulic system with full electrical controls. This specially built Duplex Half-Mill demonstrates the versatility of U. S. Burke basic milling units, providing special machine performance at minimum investment made possible by the company's wide selection of standard milling components, including a variety of head, cross slide, and table feeds; a selection of motors and drives; and a wide choice of spindle types and table sizes. Further information may be obtained from the manufacturer.

(For further details encircle index code 0304)

precision dial indicator From The L. S. Starrett Company, a super precision dial indicator with accuracy of plus or minus .00001 in., designed for applications requiring extreme precision, such as shop inspection to laboratory standards or laboratory work. Starrett No. 25-106 Dial-

No. 25-106 Super Precision Dial Indicator

Master Dial Indicator features widely spaced graduations reading .00005 in., and the dial reading is .0015–0–.0015, with a total range of .003 in. These dial indicators are furnished with jeweled bearings only.

(For further details encircle index code 0305)

storage cabinets From Columbia-Hallowell Division, Standard Pressed Steel Company, the "800 Series" incorporating superior construction features. Made from heavy gauge cold-rolled furniture steel, the three models of the new "800 Series" are specially designed to discourage theft attempts. Doors are factory-assembled to the all-welded door frame to insure accurate "tamper-proof" fit and fast field erection. Positive three point door flap.

Hallowell Storage Cabinet

All three models of the new series measure 36 in. wide by 78 in. high by 18 or 24 in. deep. Model 815 is a double door storage cabinet with four shelves capable of storing up to 36 cu. ft. of materials. Model 835 is a double door wardrobe cabinet which holds 12 to 16 heavy coats. Model 855 is a combination wardrobe and general storage cabinet with a full-width hat shelf and half-width hanger rod. All are available in SPS green or ASA 49 gray enamel finish applied electrostatically on a base coat of iron phosphate.

The gauge of materials in the new Hallowell "800 Series" is as follows: door frame, 13 gauge; cabinet bottom and shelves 18 gauge; door panels, back panel,

(Continued on page 118)

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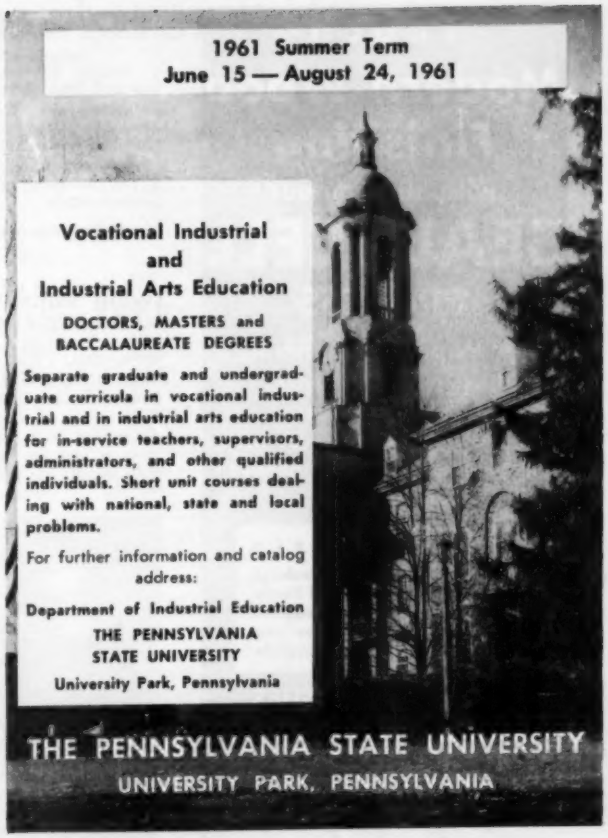

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SHOP EQUIPMENT NEWS

(Continued from page 116)

top and base plate, 20 gauge; side panels, 22 gauge. All "800 Series" cabinets are available set up or knocked down. Knocked-down units are compactly packaged in a 275-lb. test carton 2¾ in. high by 38 in. deep by 80 in. long. Ask for further details.

(For further details encircle index code 0306)

swing lathes From Logan Engineering Company, a new series of 14-in. Swing Lathes, featuring a variable speed drive of 40 to 1400 r.p.m., and providing instant speed adjustment without shifting the belt. Lathes feature 14⅝-in. swing over beds, 9-in. swing over saddle cross slides center distance of 28 in., and two precision ground V-ways and flat ways. Hardened, ground steel spindle has a 1⅛-in. hole and a draw-

14-in. Swing Lathe

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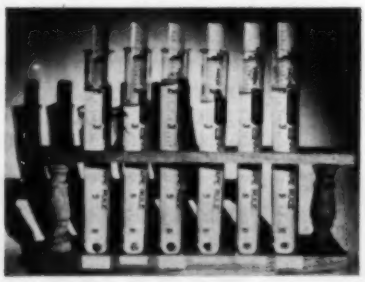
public address system From Allied Radio Corporation, the Knight Model KN-3500 — a complete, battery-powered

Knight Model KN-3500 Public Address System

public address system that can be set up anywhere quickly in conference rooms, trade show exhibits, etc., requiring no wires, line cords, or speaker cables. The complete system consists of a battery-operated transistor amplifier with over 10 watts output, a directional microphone with a lavalier cord, and a flexible-shaft mike holder all housed in a sturdy, luggage-type carrying case. The carrying case has a built-in baffle with an 8-in. wide range speaker, plus an adapter for easy attachment of the mike holder. When the microphone is placed in the holder, the carrying case becomes a convenient speaker's podium. Listed under Allied Stock No. 35 DU 799. The system can be converted to 110-120 volt a.c. use by adding an optional power supply. The power supply for converting is listed under Stock No. 35 D 733.

(For further details encircle index code 0308)

steel tape clad in Mylar From Stanley Tools, division of The Stanley Works, a steel tape rule unique in durability and legibility, has a new type of blade with high resistance to abrasion. The film — called Mylar — which completely covers the blade is not affected by most solvents, alkalies, and acids. Of value to tape rule users — painters, maintenance men, mechanics, technicians, builders, and homeowners — tests prove that blade sections showed no harmful effects after 100 hours immersed in paint thinner, alcohol, machine oil, turpentine, gasoline, and other solutions. Mylar is the DuPont polyester



Steel Tapes covered with Polyester Film called Mylar

film which covers the steel tape with its black-on-yellow blade markings, adopted for maximum visibility. Rules available in six sizes: in 6, 8, 10, and 12-ft. lengths with half-inch width blades, and the ¾-in. width in 10 and 12-ft. lengths. Other features include a Tru-Reading mouth, a Tru-Zero hook, foot and inch markings and stud markings. New "Fits-All" Mylar replacement blades for Stanley and other popular tape rules are also available.

(For further details encircle index code 0309)

multi-purpose magnet From General Scientific Equipment Company, the G-S Little Giant Magnet, made of supermagnetic alloy, no larger than a fountain pen. Point of magnet is extended or retracted from case by turning end-knob; strength of magnet can be controlled by amount of extension. Pocket clip is provided for safe, easy carrying. Diameter of magnet ¼ in., total length 6¼ in. The G-S Magnet No. 15 is particularly useful for removing steel or iron particles from areas where such foreign matter is harmful, such as the operating area of electrical instruments or delicate mechanisms. It will also conveniently remove sharp particles of steel, iron, or nickel from storage bins and

(Continued on page 120)

Directory of Manufacturers' Products

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 131. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 132.

A

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Brodhead-Garrett Co.
Patterson Bros.
Peck, Stow & Wilcox Co.

B

BABBITT FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.

BAND SAW BLADES
Boice-Crane Co.
Delta Mfg. Co.
Duro Metal Products Co.
Midwest Shop Supplies
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Shopmaster, Inc.
Starrett Co., The L. S.
Upholstery Supply Co.

BAND SAW BRAZERS, Electric
Boice-Crane Co.
Foley Mfg. Corp.
Nelson & Jacobsen, Inc.
Oliver Machinery Co.

BAND SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Midwest Shop Supplies
Nelson & Jacobsen, Inc.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Shopmaster, Inc.
Yates-American Machine Co.

BAND SAWS, METALCUTTING
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.

BAND SAWS, PORTABLE
Brodhead-Garrett Co.
Delta Mfg. Co.
Patterson Bros.

BAND SAW SETS
Brodhead-Garrett Co.
Oliver Machinery Co.

BENCH FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Johnson Gas Appliance Co.
McEnglevan Heat Treating & Mfg. Co.
Midwest Shop Supplies
Patterson Bros.
Thermolyne Corp.

BENCH-PLATES
Challenge Machinery Co.
Dixon, Inc., William
Patterson Bros.
Peck, Stow & Wilcox Co.

BENCH TOPS
Angle Steel, Inc.
Hardwood Corp. of America
Patterson Bros.
Shop-Bilt

BENCHES
Jewelers' and Metal Workers'
Angle Steel, Inc.
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Parent Metal Products, Inc.
Patterson Bros.
Saxcrafts
Shop-Bilt

BENCHES, MANUAL TRAINING
Angle Steel, Inc.
Brodhead-Garrett Co.
Challenge Machinery Co.
Engineering Mfg. Co.
Hamilton Manufacturing Co.
Parent Metal Products, Inc.
Patterson Bros.
Shop-Bilt
South Bend Lathe Works
Tolerton Co.

BENCHES — WORK
Challenge Machinery Co.
Dixon, Inc., Wm.
Midwest Shop Supplies
Patterson Bros.
Shop-Bilt
Stoner Wood Products Co.
Tolerton Co.

BENCH VISES
Angle Steel, Inc.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Dixon, Inc., William
Midwest Shop Supplies
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Saxcrafts
Stanley Tools
Swayne, Robinson & Co.
Tolerton Co.
Upholstery Supply Co.

BENDERS, METALWORKING
Dixon, Inc., William
Hossfeld Mfg. Co.
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Peck, Stow & Wilcox Co.
Swayne, Robinson & Co.

BINDERY EQUIPMENT & SUPPLIES
Black & Decker Mfg. Co.
Challenge Machinery Co.

BIT HOLDERS, EXTENSION
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

BITS, Auger, Machine, Hollow Chisel, Router
Brodhead-Garrett Co.
Chicago-Latrobe
Irwin Auger Bit Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Tools
Upholstery Supply Co.
Williams Co., J. H.

BITS, SCREW DRIVERS
Brodhead-Garrett Co.
Irwin Auger Bit Co.
Patterson Bros.
Snap-on Tools Corporation
Stanley Electric Tool Div.
Stanley Tools
Upholstery Supply Co.

BLACKBOARD DRAWING SETS
Alvin & Company
Brodhead-Garrett Co.
Modern School Supplies
Post Company, Frederick
Weber Co., F.

BLACKSMITH TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Stanley Tools

BLOWERS, FORGE
American Gas Furnace Co.
Brodhead-Garrett Co.
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.

BLOWPIPES, Brazing, Jewelers'
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

BLUE-PRINTING MACHINES, ELECTRIC
Midwest Shop Supplies
Post Company, Frederick

BOARDS, DRAWING
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dick Blick Co.
Fairgate Rule Co.
Garrett Tubular Products, Inc.
Hamilton Mfg. Co.
Midwest Shop Supplies
Modern School Supplies
Post Company, Frederick
Saxcrafts
Stacor Equipment Co.
Tolerton Co.
Weber Co., F.

BOLTS, STOVE, HANGER and Carriage
Upholstery Supply Co.

BOOKBINDERS' SUPPLIES
Black & Decker Mfg. Co.
Higgins Ink Co., Inc.

BORERS, WOOD
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

BORING BARS
Armstrong Bros. Tools
Brodhead-Garrett Co.
Patterson Bros.
South Bend Lathe Works
William & Co., J. H.

BORING TOOLS
Armstrong Bros. Tools
Brodhead-Garrett Co.
DeWalt Products Co.
Midwest Shop Supplies
Patterson Bros.
South Bend Lathe Works
Stanley Tools
Williams & Co., J. H.

BOW COMPASSES, DIVIDERS, PENS, PENCILS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dick Blick Co.
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Co., F.

BRACES
Brodhead-Garrett Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

BRACKETS, SAWHORSE
Midwest Shop Supplies
Upholstery Supply Co.

BRACKETS, LEG
Wilkenson Mfg. Co.

BRAD AWLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

BRAKES, METALWORKING
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Peck, Stow & Wilcox Co.
Stueck, Inc., W. Whitney

BRAKE SERVICE EQUIP., AUTOMOTIVE
Barrett Equipment Co.

BRASS FURNACES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BRAYERS
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts

BRAZING TORCHES
American Gas Furnace Co.
Patterson Bros.

BRISTOL BOARD
Brodhead-Garrett Co.
Dick Blick Co.
Post Company, Frederick
Saxcrafts
Weber Co., F.

BRUSHES, ARTISTS'
Alvin & Company
Brodhead-Garrett Co.
Dick Blick Co.
Modern School Supplies
Saxcrafts
School Products Co.
Weber Co., F.

BRUSHES, CIRCULAR, BRISTLE AND WIRE (All Kinds)
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Knudson, E. C.
Midwest Shop Supplies
Saxcrafts

BUFFERS, BENCH, PEDESTAL
Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Dixon, Inc., William
Midwest Shop Supplies
Patterson Bros.

C

CABINET HARDWARE
Angle Steel, Inc.
Brodhead-Garrett Co.
Midwest Shop Supplies
Upholstery Supply Co.

CABINETS, Cuts, Furniture, Galleys, Inks, Type, and Rollers
Angle Steel, Inc.
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Tolerton Co.

CALIPERS
Alvin & Company
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Lufkin Rule Co.
Millers Falls Co.
Modern School Supplies
Patterson Bros.
Starrett Co., L. S.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co.
Craftools, Inc.
Midwest Shop Supplies
Patterson Bros.
Saxcrafts

CENTER LATHE
Brodhead-Garrett Co.
DeWalt Products Co.
LeBlond Machine Tool Co.
Patterson Bros.
South Bend Lathe Works

CERAMICS, SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Donjer Products
Electric Hotpack Co., Inc.
Midwest Shop Supplies
Saxcrafts
School Products Co.
Seeley's Ceramic Studio

CHARTS
Brodhead-Garrett Co.
Starrett Co., The L. S.

CHASING TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts

CHISELS, Cape, Cold, Grooving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Peck, Stow & Wilcox Co.
Snap-on Tools Corp.
Stanley Tools
Williams Co., J. H.

CHISELS, FRAMING, MORTISE
Boice-Crane Co.
Brodhead-Garrett Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

CHISELS, Metal Cutting and Wood Carving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Dixon, Inc., William
Duro Metal Products Co.
Greenlee Tool Co.
Patterson Bros.
Saxcrafts
Upholstery Supply Co.
Williams Co., J. H.

CHUCKS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
South Bend Lathe Works

CHUCKS, DRILL
Brodhead-Garrett Co.
Chicago-Latrobe
Cincinnati Lathe & Tool Co.
DeWalt Products Corp.
Dixon, Inc., William
Patterson Bros.
Stanley Electric Tools
Tolerton Co.

CHUCKS, INDEPENDENT, Universal Combination
Brodhead-Garrett Co.
Boice-Crane Company
Midwest Shop Supplies
Patterson Bros.
South Bend Lathe Works

CIRCULAR-SAW BENCHES
Atlas Press Co.
Boice-Crane Company

2 HANDCRAFTS CATALOGS F-R-E-E!

- Latest Project Ideas
- Complete Supplies, Kits
- Top Quality and Value
- Fast, Complete Delivery

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KNIGHT NAME-PLATE KIT

H. T. BARTRAN

provides practical experience in metal casting

The Knight Cast Name-Plate Kit gives industrial arts students practical molding experience. Using present metal melting and molding equipment, students can cast lead, bronze or aluminum nameplates for doors, desks, mail boxes, machinery, etc. Kit contains 94-piece font of professional pattern letters that can be used over and over again, plus an attractive 2" x 8" border tablet pattern. No additional equipment required. Only pennies for materials.

Complete Kit: $8.95 postpaid

Pattern letters for foundries since 1863

H. W. KNIGHT & SON, INC.
60 Lane Street, Seneca Falls, N.Y.

Please send ___ Pattern-Making Kits. Enclosed is check/money order for $_____. (No COD)

School _____

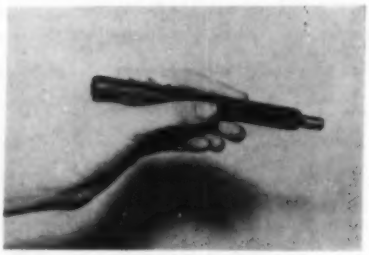
Address _____

City _____ State _____

Attention: _____

SHOP EQUIPMENT NEWS

(Continued from page 118)

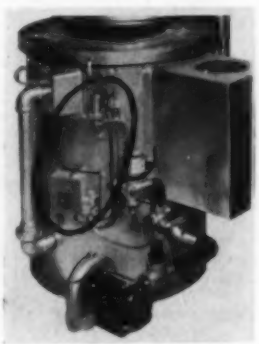


Multi-Purpose Magnet

retrieve magnetic particles from holes and similar hard-to-reach places. Useful for testing coat of surfaces for magnetic properties of under-material; also in first aid stations to remove steel splinters from eyes or skin of employees; instrument may be sterilized without harming the magnet.

(For further details encircle index code 0310)

safety pilot system From The Johnson Gas Appliance Company, a new optional safety pilot system which can be specified for use with their No. 510 Crucible Furnace. This pilot system eliminates

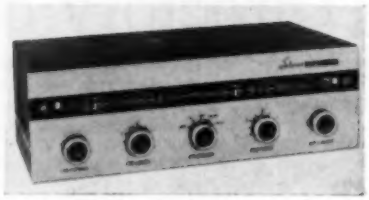


No. 510 Crucible Furnace showing the new pilot system

backfire when lighting the furnace; it also automatically shuts off the gas if the flame goes out, an important safety feature, particularly in the school shop. This new system was specifically designed for the convenience and safety of student operators.

(For further details encircle index code 0311)

fm/am stereo tuner From Electronic Instrument Company, Inc., the fm/am Stereo Tuner in both kit and factory-wired form. Prewired, prealigned RF and IF stages of both the FM and AM sections make the set easy to build from kit, and eliminate the problem of alignment. The new tuner features EICO's "Eye-tronic" traveling tuning indicators which contract into an exclamation point at the exact center of each broadcast channel, and is distinguished also by its new high styling. Two completely independent



FM/AM Stereo Tuner

sets of controls allow the ST96 to be used for separate FM and AM reception, or for FM/AM stereo (also for FM-Multiplex with adaptor). The FM section has switched AFC, as well as AGC, stabilized low limiting threshold for weaker signals, and broad-band ratio detector for improved capture ratio and easier tuning. Detailed information available on numerous additional features. Please write.

(For further details encircle index code 0312)

solders and fluxes From Kester Solder Company, their line of solders, soldering fluxes and soldering accessories, also the products of Kester Acid-Core Solder, and other items such as Kester Radiator Solder (Flux-Core), as well as Kester "Resin-Five" Core Solder which contains a special flux that is non-corrosive and electrically non-conductive, and specially suited for automotive electrical sys-

Kester Solder for Automotive Servicing

tems and radio servicing. Kester Solder Company products were on exhibit in Booth No. 2751–2752 at the I.A.S.I. Show, February 16 through 19th, 1961, at Chicago, Ill.

(For further details encircle index code 0313)

tape recorder From Allied Radio Corporation, the Knight KN-4025 monophonic tape recorder, of interest to home or school users. Supplied in a luggage-type case, carrying weight 19 lb., accommodates reels up to 7 in., diameter to permit making extra-long recordings when switched to the slower of its two speeds. Ample controls and inputs are provided on the KN-4025 to assure convenient and versatile operation. Speeds of 3¾ and 7½ in. per second are fingertip selected and a single-level control is used for play-idle-record functions. It also features: 6-watt amplifier; built-in 5-in. woofer and 4-in. tweeter with electrical crossover network; separate volume and tone controls; input jack for

(Continued on page 122)

Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Upholstery Supply Co.
Yates-American Machine Co.

CIRCULAR SAWS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
DeWalt Products Corp.
Duro Metal Products Co.
Midwest Shop Supplies
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.

CLAMPS, ADJUSTABLE, BAR
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.
Upholstery Supply Co.
Williams Co., J. H.

CLAMPS, CARRIAGE, SCREW, WELDERS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Lufkin Rule Co.
Patterson Bros.
Upholstery Supply Co.
Williams Co., J. H.
Wilton Tool Mfg. Co., Inc.

CLEANERS, FILE
Cincinnati Tool Co.
Dixon, Inc., Wm.
Knudson, E. C.
Saxcrafts

COMBINATION SQUARES
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Fairgate Rule Co.
Lufkin Rule Co.
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.

COMPOSING STICKS
Rouse & Co., H. B.

CONTROLLERS, ELECTRIC
Electric Hotpack Co., Inc.

COPING SAW BLADES
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

COPING SAWS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

COPPER NOVELTIES
Copper Shops
Donjer Products
Midwest Shop Supplies
School Products Co.

COPPER PROJECTS
Donjer Products

COPYING MACHINES — COPYFLEX
Bruning Co., Inc., Charles

CORD, FURNITURE
Upholstery Supply Co.

COUNTERSINKS
Barrett Equipment Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

CURVES, IRREGULAR
Alvin & Company
Brodhead-Garrett Co.
Dick Blick Co.
DeWalt Products Corp.
Duro Metal Products Co.
Modern School Supplies
Post Company, Frederick
Weber Company, F.

CUT-OFF SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Yates-American Machine Co.

CUTTER HEADS
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Patterson Bros.
Yates-American Machine Co.

CUTTER & TOOL GRINDERS
Boice-Crane Co.
Brodhead-Garrett Co.,
Brown & Sharpe Mfg. Co.
LeBlond Machine and Tool Co., R. K.
Patterson Bros.

CYLINDER PRINTING PRESS
Challenge Machinery Co.

D

DADO HEADS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Yates-American Machine Co.

DESKS, Instructors'
Parent Metal Products, Inc.
Shop-Bilt

DIVIDING HEAD
U. S. Burke Machine Tool Div.
Universal Vise & Tool Co.

DO IT YOURSELF PROJECTS
Saxcrafts
School Products Co.

DOWEL POINTERS
Brodhead-Garrett Co.
Patterson Bros.

DOWELING JIGS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

DRAFTING MACHINES
Alvin & Company
Bruning Co., Inc., Charles
Midwest Shop Supplies
Modern School Supplies

DRAFTING PAPER
Alvin & Company
Bruning Co., Inc., Charles
General Finishes Sales & Service Co.
Modern School Supplies
School Products Co.

DRAFTING PENS
Alvin & Company
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dick Blick Co.
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAFTING TABLES
Alvin & Company
Angle Steel, Inc.
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dick Blick Co.
Garrett Tubular Products, Inc.
Hamilton Mfg. Co.
Modern School Supplies
Parent Metal Products, Inc.
Post Company, Frederick
Shop-Bilt
Stacor Equipment Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dick Blick Co.
Fairgate Rule Co.
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Company, F.

DRAWING INSTRUMENTS REPAIR PARTS
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Modern School Supplies
Post Co., Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING OUTFITS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dick Blick Co.
Modern School Supplies
Post Company, Frederick
Saxcrafts
V & E Mfg. Company
Weber Co., F.

DRAWING PAPER IN ROLLS AND SHEETS
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dick Blick Co.
Modern School Supplies
Post Company, Frederick
Saxcrafts
School Products Co.
Weber Co., F.

DRILL PRESSES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Shopmaster, Inc.
South Bend Lathe Works

DRILL SHARPENERS
Atlas Press Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools Corp.

DRILL STANDS, BENCH, POST, PEDESTAL
Angle Steel, Inc.
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Patterson Bros.
Shopmaster, Inc.
Snap-on Tools, Corp.
South Bend Lathe Works
Stanley Electric Tools

DRILLING MACHINES, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools Corp.
Stanley Electric Tools

DRILLING MACHINES, RADIAL
Boice-Crane Co.
Shopmaster, Inc.

DRILLS
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Dowl-It Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Stanley Electric Tool Div.
Sunbeam Corp
Upholstery Supply Co.

DRILLS, BENCH AND FLOOR, HIGH SPEED
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Shopmaster, Inc.
South Bend Lathe Works

DRILLS, BREAST
Brodhead-Garrett Co.
Patterson Bros.
Snap-On Tools Corp.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Brodhead-Garrett Co.
Patterson Bros.
Saxcrafts

DRILLS, HAND
Dixon, Inc., William
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools
Upholstery Supply Co.

DUST COLLECTORS
Craftools, Inc.
Patterson Bros.
School Products Co.

E

ELECTRIC WELDING EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.
Midwest Shop Supplies

ELECTRIC EQUIPMENT, WIRE & SUPPLIES
Brodhead-Garrett Co.
Ohmite Mfg. Co.

ELECTRIC GENERATORS
Standard Electric Time Co.

ELECTRIC MOTORS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., Wm.
Patterson Bros.

ELECTRIC SOLDERING IRONS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools

ELECTRICAL INSTRUMENTS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Thermolyne Corp.

ELECTRONIC TRAINING PACKAGES
Dumville Instrument Co.
Philco TechRep Div.
Science Electronics

ENAMELING ON COPPER SUPPLIES
Copper Shop
Craftools, Inc.
Dixon, Inc., William
Saxcrafts
School Products Co.

ENGRAVERS' TOOLS AND SUPPLIES
Dixon, Inc., William
Plasticast Co.
Saxcrafts

ENVELOPES
Western States Envelope Co.

F

FILES AND RASPS
Brodhead-Garrett Co.
Dixon, Inc., William
Foley Mfg. Co.
Midwest Shop Supplies
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Upholstery Supply Co.

FILING CASES
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Weber Co., F.

FILING MACHINES
Boice-Crane Co.
Foley Mfg. Co.
Sales Service Mfg. Co.

FILMS, INDUSTRIAL TRAINING TEACHING, ETC.
Aluminum Co. of America
Dick Blick Co.
Eastman Kodak Co.
Jam Handy Organization
South Bend Lathe Works
Starrett Co., The L. S.

FINISHING MATERIALS
Brodhead-Garrett Co.
Donjer Products
General Finishes Sales & Service Co.
Patterson Bros.
Upholstery Supply Co.

FIRE BRICK AND CEMENT
Electric Hotpack Co., Inc.
Saxcrafts

FIRE CLAY
Brodhead-Garrett Co.
Saxcrafts

FISH GLUE, LIQUID
Saxcrafts
Upholstery Supply Co.

FLASKS
Brodhead-Garrett Co.
Sterling National Industries, Inc.

FLEXIBLE SHAFT AND MOTOR OUTFITS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

FLEXIBLE STEEL TAPE RULES
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Modern School Supplies
Patterson Bros.
Snap-on Tools Corp.
Weber Co., F.

FLOCK EQUIPMENT AND SUPPLIES
Brodhead-Garrett Co.
Dick Blick Co.
DonJer Products
Saxcrafts
School Products Co.

FLOORING — HARD MAPLE & RED OAK
Wells Lumber Co., J. W.

FLUX, SOLDERING
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts
Johnson Gas Appliance Co.
Kester Solder Co.
Patterson Bros.

FOLDING RULES
Alvin & Company
Brodhead-Garrett Co.
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

FORGE TOOLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

FORGES, Annealing & Melting
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.
Sunbeam Equipment Corp.

FORGES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.
Sunbeam Equipment Corp.

FOUNDRY EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Cerro Sales Corp.
McEnglevan Heat Treating & Mfg. Co.
Sterling National Industries, Inc.
Tolerton Co.

FREQUENCY METERS, Portable and Switchboard
Brodhead-Garrett Co.

FURNACES, Annealing, Case-Hardening, Forging, Heat Treating, Metal Melting, Soldering, Tempering
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Electric Hotpack Co., Inc.
Johnson Gas Appliance Co.
McEnglevan Heat Treating & Mfg. Co.
Midwest Shop Supplies
Patterson Bros.
Sunbeam Equipment Corp.
Thermolyne Corp.

G

GALVANOMETERS
Dumville Instrument Co.

GAUGES, BIT, CABINET, RULE, AND SQUARE
Brodhead-Garrett Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Tools

GAUGES, BRAKE SHOE SETTING
Barrett Equipment Co.

GAUGES, CALIPER
Brodhead-Garrett Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.

GAUGES, MARKING, THICKNESS, AND THREAD
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Brown & Sharpe Mfg. Co.
Duro Metal Products Co.
Lufkin Rule Co.
Magnaflux Corp.
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SHOP EQUIPMENT NEWS

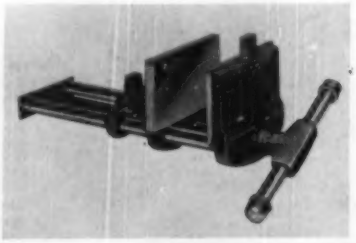
(Continued from page 120)

Knight KN-4025 Monophonic Tape Recorder

recording from mike, radio, TV set or phonograph; and output jack for playback through external speaker. The KN-4025 features fast wind and fast rewind with lock-in rewind position. For further information write to the manufacturer.

(For further details encircle index code 0314)

woodworkers' vises From The Columbian Vise & Mfg. Company, 16 models available with chrome-coated tubular steel as well as hardwood handles. These

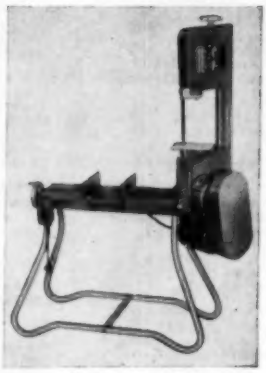


Columbian's Woodworkers' Vise

models apply to both rapid acting continuous screw and solid nut continuous screw 7 and 10-in. jaw sizes. Rubber bumper washers are used to cushion shock.

(For further details encircle index code 0315)

convertible band saw From Wells Manufacturing Corporation, a compact metal cutting band saw. Designed as the Wells Model 300, it can be used as a horizontal cut-off saw or as an upright band saw for cutting angles, slots, notches, and bevels. Maximum horizontal cutting capacity is 3½ by 6 in., for rectangular shapes, 3½-in. diameter (3-in. pipe) for rounds. Powered by a ¼ h.p., 115-v. motor with a "V" belt drive, it offers selective blade speeds of 54, 100, and 190 feet per minute. A positive screw action vise holds stock for horizontal cut-off work. Gravity feed and a switch which automatically shuts the machine off at the completion of the cut permits unattended operation. Overload protection is provided. To convert to a vertical saw the head is swung into a vertical position. The frame unit is equipped with a 4 by 6-in. integral work



Model 300 Band Saw

table. Throat height is 7 in., and throat depth is 6 in. The Wells Model 300 takes only 16½ in., by 38½-in. floor space. The bed measures 6½ by 24 in. Overall height is 34½ in., with the frame horizontal, 51 in., with the frame in the vertical position. Top of the bed is 24 in., from the floor. Weight of entire unit approximately 110 lb. Further descriptive details may be obtained from the manufacturer.

(For further details encircle index code 0316)

visual safety saw From Brett-Guard Corporation, their visual safety tool being offered as optional equipment with the circular table variety saw, tilting arbor type, manufactured by the Northfield Ma-

Visual Safety Guard

chinery and Foundry Company. This announcement was made by Northfield after exhaustive tests. Brett-Guard is made of clear Plexiglas plastic so that work can be seen at all times and is so designed that the guard itself exerts a downward pressure on work. All common circular-saw operations can be performed with this new safety guard in normal position. Can also be used as an overriding fence for angular work. Additional information available.

(For further details encircle index code 0317)

dust blower From Belsaw Machinery Company, an easily installed dust blower designed for collecting saw dust and shavings from saws, planers, and other woodworking machines. The hood of this dust blower is attached directly to any woodworking machine, and the saw dust is carried through a flexible hose of any desired length to a waste container, with

(Continued on page 124)

GENERATOR TEST BENCHES
Standard Electric Time Co.

GLASS CUTTER
Brodhead-Garrett Co.
Lufkin Rule Co.
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

GLAZING TOOLS
Brodhead-Garrett Co.
Saxcrafts
Upholstery Supply Co.

GLUE
Bordon Co., The
Brodhead-Garrett Co.
General Finishes Sales & Service Co.
Higgins Ink Co., Inc.
Midwest Shop Supplies
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

GLUE POTS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Oliver Machinery Co.
Patterson Bros.
Upholstery Supply Co.

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Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Electric Tools

GRINDERS, BENCH, PEDESTAL TYPE
Atlas Press Co.
Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Mummert-Dixon Co.
Patterson Bros.
Snap-on Tools Corp.
Stanley Electric Tools
U. S. Burke Machine Tool Div.

GRINDERS, OILSTONE
Atlas Press Co.
Brodhead-Garrett Co.
Mummert-Dixon Co.
Oliver Machinery Co.

GRINDERS, TOOL ROOM, SURFACE
Atlas Press Co.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
South Bend Lathe Works
Stanley Electric Tool Div.

GRINDING MACHINES
Plain Universal, Centerless
Atlas Press Co.
Barrett Equipment Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.

GRINDING WHEELS
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Stanley Electric Tool Div.

H

HACKSAW BLADES
Brodhead-Garrett Co.
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Starrett Co., The L. S.
Upholstery Supply Co.

HACKSAWS, Portable, Electric, Power
Berkroy Products Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Midwest Shop Supplies
Misener Mfg. Corp.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.

HAMMERS
Brodhead-Garrett Co.
Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Stanley Tools
Upholstery Supply Co.
Williams Co., J. H.

HAMMERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Stanley Electric Tools

HAND SAWS, PORTABLE ELECTRIC
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Brodhead-Garrett Co.
Patterson Bros.
Saxcrafts
Stanley Electric Tools
Upholstery Supply Co.

HAND SCREWS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Patterson Bros.
Upholstery Supply Co.

HANDICRAFT SUPPLIES
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Copper Shop
Craftools, Inc.
Craftsman Wood Service Co.
Dixon, Inc., William
Donjer Products
General Finishes Sales & Service Co.
Hammett Co., J. L.
Patterson Bros.
Saxcrafts
School Products Co.
Upholstery Supply Co.
X-acto, Inc.

HARDIES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

HEAT-FLOW METERS
Brodhead-Garrett Co.

HEATING ELEMENTS, ELECTRIC
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Hones, Inc., Charles A.
Saxcrafts

HEAT-TREATING EQUIPMENT
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Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
McEnglevan Heat Treating & Mfg. Co.
Patterson Bros.
Saxcrafts
Sunbeam Equipment Corp.
Thermolyne Corp.

HOT PLATES
Thermolyne Corp.

I

IMPACT TOOL, Portable Electric
Snap-on Tools Corp.

IMPORTED WOODWORKING TOOLS
Mittermeier, Frank
Saxcrafts
Upholstery Supply Co.

IMPORTERS' GERMAN DRAWING INSTRUMENTS
Alvin & Company
Dick Blick Co.
Modern School Supplies

INK REMOVERS
Alvin & Company
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Modern School Supplies
Saxcrafts
Weber Company, F.

INKS, DRAWING AND COLORED
Alvin & Company
Brodhead-Garrett Co.
Dick Blick Co.
Higgins Ink Co., Inc.
Modern School Supplies
Post Company, Frederick
Saxcrafts
School Products Co.
Weber Company, F.

INKS, PRINTING
Brodhead-Garrett Co.
Driscoll & Co., Martin
Saxcrafts

J

JEWELERS' TOOLS, EQUIPMENT AND SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Wilton Tool Mfg. Co., Inc.

JIG SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Midwest Shop Supplies
Oliver Machinery Co.
Patterson Bros.
Saxcrafts
Shopmaster, Inc.
Yates-American Machine Co.

JOINTERS, BENCH, HAND
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Yates-American Machine Co.

K

KEENE CEMENT
Brodhead-Garrett Co.

KILNS
Brodhead-Garrett Co.
Copper Shop
Craftools, Inc.
Electric Hotpack Company, Inc.
Saxcrafts
School Products Co.

KNIVES, BAND, MACHINE
Brodhead-Garrett Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

KNIVES, HOBBY
Alvin & Company
Brodhead-Garrett Co.
Dixon, Inc., William
Modern School Supplies
Saxcrafts
School Products Co.
X-acto, Inc.

KNIVES, SLOYD
Alvin & Company
Brodhead-Garrett Co.
Dick Blick Co.
Dixon, Inc., William
Modern School Supplies
Patterson Bros.
Saxcrafts
School Products Co.

KNOCK-DOWN FURNITURE
Bedford Lumber Co.
Brodhead-Garrett Co.
Giles & Kendall

KNURLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

L

LABORATORY STANDARD INSTRUMENTS
Electric Hotpack Co., Inc.

LAMP PARTS & SUPPLIES
Gyro Lamp & Shade Co.

LATEX MOLDING COMPOUNDS
Saxcrafts
School Products Co.

LATHE ATTACHMENTS
Armstrong Bros. Tool Co.
Atlas Press Co.
Barrett Equipment Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.
Sheldon Machine Co., Inc.
Shopmaster, Inc.
South Bend Lathe Works
Universal Vise & Tool Co.
Williams Co., J. H.

LATHES, Bench, Metal Working
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Midwest Shop Supplies
Patterson Bros.
Sheldon Machine Co., Inc.
South Bend Lathe Works

LATHES, GAP BED
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Corp.
LeBlond Machine Tool Co., Inc.

LATHES, BRAKE DRUM
Barrett Equipment Co.

LATHES, SMALL PRECISION
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
South Bend Lathe Works
Sheldon Machine Co., Inc.

LATHES, SPINNING
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Oliver Machinery Co.
Patterson Bros.
Sheldon Machine Co., Inc.

LATHES, WOODWORKING
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Mfg. Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

LAYOUT SURFACE PLATES
Challenge Machinery Co.

LEAD AND RULE CUTTERS
Brodhead-Garrett Co.
Rouse Co., H. B.

LEAD HOLDERS, DRAFTING
Alvin & Company

LEADS, DRAFTING
Alvin & Company
X-acto Crescent Prod. Co.

LEATHER
Brodhead-Garrett Co.
Constantine & Son, Albert
Larson Co., J. C.
Saxcrafts
Tandy Leather Co.
Upholstery Supply Co.

LEATHER WORKING TOOLS AND SUPPLIES
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Dixon, Inc., William
Larson Co., J. C.
Saxcrafts
Tandy Leather Co.
X-acto, Inc.

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Wilkenson Mfg. Co.

LETTERS AND FIGURES FOR STAMPING METALS
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Dixon, Inc., William
Knight & Son, H. W.
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Bruning Co., Inc., Charles
Lufkin Rule Co.
Patterson Bros.
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Stanley Tools
Starrett Co., L. S.
Upholstery Supply Co.

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Saxcrafts
School Products Co.
X-acto, Inc.

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Dick Blick Co.
Saxcrafts
School Products Co.
Weber Co., F.
X-acto, Inc.

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Saxcrafts

LOOMS
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Hammett Co., J. L.
Saxcrafts

LUMBER
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Constantine & Son, Albert
Craftsman Wood Service Co.
Foley Lumber Co., T. A.
Giles & Kendall
Hardwood Corp. of America
Wells Lumber Co., J. W.

LUMBER — HARDWOODS
Brodhead-Garrett Co.
Constantine & Son, Albert
Hardwood Corp of America
Wells Lumber Co., J. W.

M

MACHINE KNIVES, JOINTER AND SURFACER
Boice-Crane Company
Brodhead-Garrett Co.
DeWalt Products Corp.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Yates-American Machine Co.

MACHINE LIGHTS
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South Bend Lathe Works

MACHINE TOOL DRIVES
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Patterson Bros.
Williams Co., J. H.

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Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Midwest Shop Supplies
Patterson Bros.
Stanley Tools
Starrett Co., L. S.

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Dixon, Inc., William
Patterson Bros.
Saxcrafts

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Cincinnati Tool Co.
Craftsman Wood Service Co.
Fairgate Rule Co.
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Stanley Tools
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Upholstery Supply Co.

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Parent Metal Products, Inc.
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Brodhead-Garrett Co.
Johnson Gas Appliance Co.
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Columbia Machinery & Supply Co.
Dixon, Inc., William
Donjer Products
Duro Metal Products Co.
Lufkin Rule Co.
Patterson Bros.
Saxcrafts
Swayne, Robinson & Co.

METAL CUTTING SAWS
Berkroy Products Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Patterson Bros.
Sales Service Mfg. Co.
Saxcrafts
Stanley Electric Tool Div.

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Patterson Bros.
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SHOP EQUIPMENT NEWS

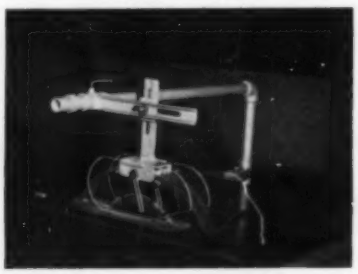
(Continued from page 122)

Dust Blower

the paddle wheel fan in the blower giving suction for even the coarsest shavings; also portable for general shop cleaning. The complete unit, shipped assembled, weighs 45 lb., and includes collector-hood, flexible hose, fan blower, ¼ h.p. electric motor, switch cord, plug, v-belt, and pulley. For further details, please write.

(For further details encircle index code 0318)

saw guard From R. E. Peterson Company, designed to meet all safety regulations, shop tested and proven, utilizing unique features. Available for tilting arbor or table, attaches by base-arm mounting



REPCO Saw Guard

to edge of table. It can instantly swing out away from the saw or be entirely removed from its base, depending on the job, and as quickly returned to conventional location and locked in place. Sliding sleeve arrangement of guard to front bar features "slot and key" stop rings for maximum right and left location, as well as ease of lifting guard for changing saw blades. Among other features it provides: visibility of all work; coil spring hold-down pressures to each blade preventing material from raising by upward centrifugal force; assistance for all dado work; and safety throughout.

(For further details encircle index code 0319)

hi-fi amplifier kits From Allied Radio Corporation, the 70-watt and the 32-watt Knight-Kit Stereo Hi-Fi Amplifier Kits. The 70-watt unit delivers ample power to accommodate any stereo requirements and includes highly flexible control

(Continued on page 126)

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Patterson Bros.
Saxcrafts

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Patterson Bros.
Saxcrafts

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Brodhead-Garrett Co.
Delta Mfg. Co.
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Dixon, Inc., William
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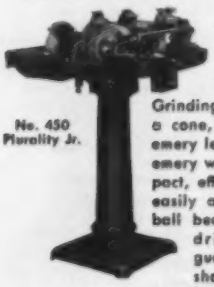

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SHOP EQUIPMENT NEWS

(Continued from page 124)

facilities; it delivers continuous undistorted power output of 35 watts per channel; IHFM music power rating is 96 watts. Special feature is a stereo "blend" control which assures the user of optimum stereo effect by electronically "moving" the speakers nearer together or farther apart to decrease or increase channel separation; also a center-channel output; output recording jacks independent of volume and tone con-

Hi-Fi Amplifier Kits — (upper) the 70-Watt and (lower) the 32-Watt

trol settings, plus a tape monitor switch that allows instant comparison between the music source and the music as it is recorded on the tape. Styled in Cordovan gray with a beige and sand gold front panel of heavy, extruded aluminum, it is supplied complete with all parts and complete instructions. Stock No. 83 YU 934.

The 32-Watt Stereo Hi-Fi Amplifier Kit, finished in Cordovan gray with a blending desert beige and anodized sand-gold escutcheon, is supplied with all necessary parts, wire, solder, and instructions, and listed under Stock No. 83 YU 933. It is designed for book-shelf placement and measures 4¼ (plus ⅝-in. legs) by 14⅜ by 11¾ in. The amplifier features two fully integrated preamps offering a full complement of stereo and monophonic control facilities, and has a rated power output of 16 watts per channel and a total IHFM music power rating of 39 watts. For full information on the numerous other features of these two units, please write.

(For further details encircle index code 0320)

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(Continued on page 128)

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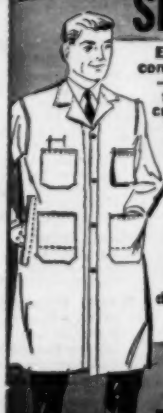

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Mummert-Dixon Co.

TOOL BITS
Armstrong Bros. Tool Co.
Barrett Equipment Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Patterson Bros.
South Bend Lathe Works

TOOL CHARTS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Snap-on Tools Corp.
Stanley Tools

TOOL GRINDERS, ELECTRIC, OILSTONE
Atlas Press Co.
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dumore Company, The
Mummert-Dixon Co.
Patterson Bros.
South Bend Lathe Works
Stanley Electric Tools
Upholstery Supply Co.

TOOL HOLDERS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
South Bend Lathe Works
Williams & Co., J. H.

TOOL ROOM GRINDERS
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
South Bend Lathe Works
Stanley Electric Tool Div.

TOOLS — SPECIAL BRAKE SERVICE
Barrett Equipment Co.

TORCHES, GAS
Dixon, Inc., William
Johnson Gas Appliance Co.
Patterson Bros.
Saxcrafts

TRACING PAPER AND CLOTH
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Modern School Supplies
Post Company, Frederick
Saxcrafts
Weber Co., F.

TRAINING AIDS
U. S. Army

TRIANGLES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Fairgate Rule Co.
Modern School Supplies
Saxcrafts
School Products Co.
Weber Co., F.

TYPE GAUGES
Challenge Machinery Co.
Lufkin Rule Co.
Rouse Co., H. B.

U

ULTRASONIC THICKNESS MEASURING EQUIPMENT
Magnaflux Corp.

UNIVERSAL BOX ANGLES
Challenge Machinery Co.

UPHOLSTERY SUPPLIES
Brodhead-Garrett Co.
Constantine & Son, Albert
Upholstery Supply Co.

V

V-BLOCKS
Challenge Machinery Co.
Patterson Bros.

VALVE GRINDING EQUIP.
Black & Decker Mfg. Co.
Snap-on Tools Corp.
South Bend Lathe Works

VENEER
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Giles & Kendall

VISES, BENCH, BLACKSMITH
Atkins & Co., E. C.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Shop-Bilt
Stanley Tools

VISES, MACHINE, METAL-WORKING
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Columbian Vise & Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Shop-Bilt
South Bend Lathe Works
Swayne, Robinson & Co.
Tolerton Co.
U. S. Burke Machine Tool Div.
Universal Vise & Tool Co.
Wilton Tool Mfg. Co., Inc.

VISES, PIPE, WOODWORKERS'
Abernathy Vise & Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
DeWalt Products Corp.
Morgan Vise Co.
Oliver Machinery Co.
Parent Metal Products, Inc.
Patterson Bros.
Shop-Bilt
Stanley Tools
Wilton Tool Mfg. Co., Inc.

VOCATIONAL GUIDANCE
U. S. Army

VOLTMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

W

WEBBING
Upholstery Supply Co.

WELDING EQUIPMENT, ELECTRIC
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.
Midwest Shop Supplies

WOOD FINISHING MATERIALS
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Doojer Products
General Finishes Sales & Service Co.
Patterson Bros.
Upholstery Supply Co.

WOOD PROJECT MATERIAL
Doojer Products

WOOD-TURNING LATHES
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

WOODWORKING MACHINES, COMBINATION
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Stanley Electric Tools

WOODWORKING SHAPERS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Greenlee Tool Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Stanley Electric Tools
Yates-American Machine Co.

WOODWORKING TOOLS AND SUPPLIES
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
Craftsman Wood Service Co.
DeWalt Products Corp.
Dixon, Inc., William
Dowl-it Co.
Duro Metal Products Corp.
Midwest Shop Supplies
Morgan Vise Co.
Oliver Machinery Co.
Patterson Bros.
Sheldon Equip. Co., E. H.
Shop-Bilt
Shopmaster, Inc.
Upholstery Supply Co.
X-acto Crescent Products Co.
Yates-American Machine Co.

WORK BENCHES
Angle Steel Inc.
Challenge Machinery Co.
Craftools, Inc.
Dixon, Inc., William
Patterson Bros.
Shop-Bilt
Stoner Wood Products Co.
Tolerton Co.

WRENCH, IMPACT — Portable, Electric
Snap-on Tools Corp.

WRENCHES, Box, Tap, Torque, Ignition, Open End, etc.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Diamond Tool & Horseshoe Co.
Duro Metal Products Corp.
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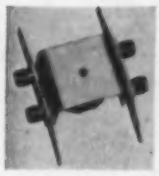

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the magnetic Jointer and Planer knife-setter that is rapidly outmoding and replacing the old, mechanically inaccurate, time-consuming straight-edge method! The necessity of tapping, prying and re-adjusting is entirely eliminated! Thousands now in use! Write for complete information and name of your nearest distributor

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Ceramic Service
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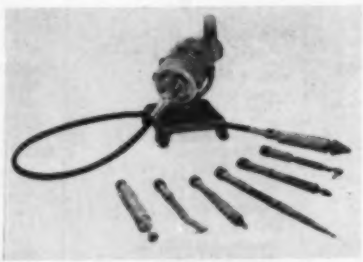
SHOP EQUIPMENT NEWS

(Continued from page 126)

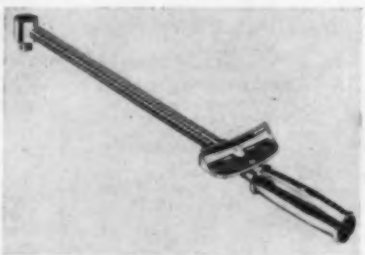


Miniature Power Tool

deburring, marking, etc. A wide selection of the company's pencil-slim and miniature angle-type handpieces, some of which are illustrated, are quickly interchangeable. Write for catalog containing complete details.

(For further details encircle index code 0321)

torque wrench offer From P. A. Sturtevant Company, a free torque wrench, available to shop teachers for classroom use at a handling, packaging, and mailing cost only. These gauge tools are reclaimed or rejected models not suitable for sale because of plating, etc., but all are in

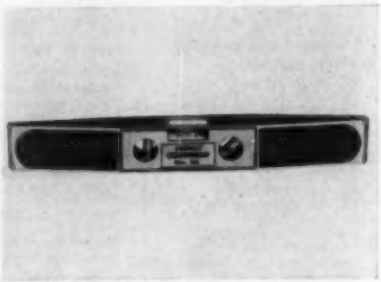


Torque Wrench

perfect working order. Models available are 50, 100, and 150 foot-pounds in limited quantities, only one tool to an instructor. Instructor must order on school letterhead, and enclose check or money order for $3.50, specifying first and second choice. Offer closes March 31. Address order to P. A. Sturtevant Co., School Offer, Dept. 3000, Addison, Ill.

(For further details encircle index code 0322)

torpedo level From The Columbian Vise & Mfg. Company, their No. 39 compact hand-fitting Torpedo Level, made of die-cast aluminum, 9 in. long, ¼ lb. in weight, has one plumb, one 45-deg. vial, and one level. Frame is finished in attractive blue with bright top plate, each level



No. 39 Compact Torpedo Level

packed in dustproof plastic pouch, the latter suitable for pegboard display. Write for Bulletin L-3321A.

(For further details encircle index code 0323)

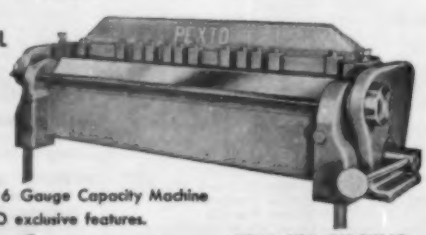
layout ruler From Polychrome Corporation, their latest aid to artists, draftsmen, architects, photographers, and offset strippers — the Stainless Steel "O" Centering Layout Ruler. Saves time and labor and increases accuracy in preparing drawings, mechanicals, and offset flats, any place where registration is important. Its special "O" center eliminates errors in layout, and the stainless steel base assures the user of maximum dimensional stability necessary in a ruler. It features two measuring scales — a regular 1-in. through 24-in. scale in 1/16-in. graduations; and the special "O" center scale. Numbers are deeply etched and black enameled for high visibility, and the surface is a nonglare finish. Further details available.

(For further details encircle index code 0324)

self-tutoring electricity course From Teaching Machines, Inc., and Grolier, Inc., a "teaching machine" course in the "Fundamentals of Electricity." Suitable for the TMI-Grolier MIN/MAX machine ($20), it has 1400 frames on 8½ by 11 in. paper and teaches junior high school definitions and formulations of the basic concepts of electricity — charge, current, potential, electromotive force, work, resistance, and capacitance. Specific topics include:

PEXTO **BOX and PAN BRAKE**

NEW MODEL PX-24 Small, Rugged



A NEW 24" x 16 Gauge Capacity Machine with many PEXTO exclusive features.

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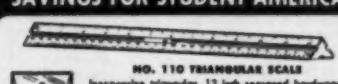

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Polished nickel finish — medium weight for proper balance and easy handling. Circles from 1/8" to 9" diameter — plastic tube contains divider shoulder needle, compass lead and spare parts. Complete in vinyl plastic protective sheath.
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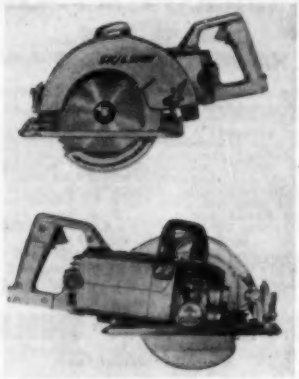
electrical nature of matter, Ohm's law, series and parallel circuits; switching and relay circuits, Kirchoff's laws, etc. Prerequires seventh-grade arithmetic; vocabulary and algebraic concepts have been kept as elementary as possible.

(For further details encircle index code 0325)

worm-drive Skilsaw models

From Skil Corporation, three completely new versions of their rear handle, worm-drive Skilsaw models. They operate on the worm gear principle which transforms the motor's high speed into great cutting power.



The new versions have retained the familiar model numbers. Models 367, 77 and 825, with blades of 6½ in., 7¼ in., and 8¼ in., give cutting depths of 2⅛ in., 2½ in., and 3 in., respectively. All models feature Skil's new "Burnout-Protection" motors which protect against motor burn outs even under excessive and frequent overloads. Other outstanding new features include an automatic oil level control, an airflow hood to direct a cooling air stream over the gear case, a push button which engages and locks the saw shaft for fast, easy blade changing, and sealed rubber bellows inside gear case which collapse when necessary to relieve oil pressure build-up and eliminate oil leakage. Please write for more detailed information.

(For further details encircle index code 0326)

DESCRIPTIVE MATERIAL

From R. K. LeBlond Machine Tool Company, a bulletin entitled "Turn With Tape," describes LeBlond Tape Turn Lathes. These are heavy duty lathes with headstocks and carriages designed to accept commands from a General Electric Mark Century solid state numerical control system. Tape Turn Lathes can turn contours, tapers, sharp angles and facing cuts all from tape. Six tools are carried in the numerically controlled tool turret — enough to perform all roughing and finishing operations on most jobs. Please write for a copy of "Turn With Tape."

(For further details encircle index code 0327)

From Niagara Machine & Tool Works, a newly-published, 6-page bulletin describing and illustrating Niagara's Series M Line of OBI presses arranged for automatic, ultra-high speed operation with progressive dies. Included are standard specifications, die space dimensions, and stroke-shutheight data for the complete line of 22, 35, 45, and 60 ton capacity models. Write for a copy of Series M Bulletin 54.

(For further details encircle index code 0328)

From Black & Decker Manufacturing Company, their latest catalog 1 (K), 49 pages, two-color, fully illustrated, listing their complete line of quality power tools and accessories, and motors, giving specifications and prices, and including a list of their factory sales and service branches. Write for your copy.

(For further details encircle index code 0329)

From Shopmaster, a division of Energy Mfg. Company, their illustrated, two-color, catalog describing their line of tools including the Shopmaster saws, planers, shapers, drill presses and sanders, along with accessories and parts, giving full specifications and prices.

(For further details encircle index code 0330)

From V. & E. Manufacturing Company, a newly released bulletin on architects and engineers scales, the latest in a series of entirely new catalogs and bulletins. Construction features, classifications of scales, and size ranges are described in Catalog No. 60-AE, which may be had by writing the company.

(For further details encircle index code 0331)

From Sunbeam Equipment Corporation, Bulletin SEC-6, a 14-page catalog in two colors, depicting the Sunbeam school shop furnaces which have proved practical for school shop use and are in wide-spread use in both schools and industry. The bulletin is designed as a helpful aid to industrial education directors, school supervisors, shop instructors, or others interested in planning new shop facilities or the expansion of present ones. Included is a furnace selection guide and heat treating process diagram. Please write for further information on leading manufacturer representatives in your vicinity.

(For further details encircle index code 0332)

From The R. K. LeBlond Machine Tool Company, their illustrated wall chart, offered free. It shows the Regal engine lathe so widely used in school shops. The lathe

LeBlond's Illustrated Wall Chart

is pictured with all its components labeled in large, easy-to-read type. The chart is printed on durable cover stock and is approximately 34 by 44 in., in size. Free copy may be obtained upon request, on school letterhead.

(For further details encircle index code 0333)

From Kester Solder Company, their newly revised instruction manual entitled "Soldering Simplified." It is devoted to teaching the fundamentals for obtaining perfect soldering results in a step-by-step-manner, and is particularly valuable to trainees and apprentices. It begins with a brief reference to the historical importance of solder in man's progress towards higher levels of

(Continued on next page)

CROW EQUIPMENT

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HAND TOOLS
HARDWARE
LEATHERWORKING SUPPLIES
MACHINE TOOLS
METALCRAFT TOOLS
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DONJER PRODUCTS COMPANY
1398 UTICA AVENUE BROOKLYN 3 NEW YORK

civilization, and then details the basic principles of soldering. Different types of solders and fluxes, and their composition are discussed. Soldering techniques, proper heat application, and the correct pre-soldering and post-soldering metal treating procedures are representative topics that are thoroughly covered in the manual. Free copies may be obtained by writing.

(For further details encircle index code 0334)

From Cleveland Crafts Company, their 1961 Craft Ideas Catalog, containing 64 illustrated pages, listing their full line of materials and supplies, tools and equipment, embracing craftwork in numerous fields, such as tile and baroque jewelry, felt craft, texstone, basketry, embedded plastics, woodcraft, copperwork, tile and stick craft, metalwork, paints and watercolors, etching, leathercraft, and other hobby areas for the interest of recreation directors, schools, summer camps, homemaker groups, and others. Complete information and prices given. Twenty-five cents.

(For further details encircle index code 0335)

from the field . . .

The Black & Decker Manufacturing Company's Product Service Division announces the appointment of Charles L. Costa to the new position of Field Manager of this division. Mr. Costa will supervise the company's product service organization throughout the United States, from the Towson, Md., office. Under his direction are four Regional Service Managers, who in turn supervise the operations of the fifty Black & Decker factory-operated service branches and thirty-five authorized service stations throughout the country.

New branch service managers are: James C. Vassell at Lincolnwood (Chicago), Ill.; David S. Stevens, Seattle; S. Michael Raymond, Des Moines, replacing Wm. Priestley, transferred to Kansas City.

The L. S. Starrett Co., Athol, Mass., announce the recent election of Walter W. Haskins as director of the company. Mr. Haskins has been associated with The L. S. Starrett Company in various sales capacities for 33 years and is presently Western Sales Manager and manager of Starrett's Chicago Branch Office and Warehouse.

The Borden Chemical Company announces the retirement of Barton B. Wadsworth, vice-president, on February 1, 1961, to devote time to other business interests. He joined the company two years after its founding in 1931.

Patterson Brothers of New York City, distributors of industrial supplies and school shop equipment, announce the appointment of Gardner S. Gould, Jr., as their New England representative effective January 16, 1961. He was formerly associated with Gould Industrial Supply Co., Inc., Leominster, Mass.

The Peck, Stow & Wilcox Company have announced the appointment of Walter J. Hushak as assistant to R. J. Ahern, president of the 175-year-old firm. Mr. Hushak will be in charge of personnel, public and industrial relations, and will also assist the president of the PEXTO Company on special assignments. He has been with the company in various capacities since 1941.

PEXTO is a manufacturer of machine and handtools for the sheet metal industry.

Cerro Corporation is the new name, effective January 1, 1961, of Cerro de Pasco Sales Corporation of New York City, a subsidiary of Cerro de Pasco Corporation.

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Build Home Workshop Machines. Designed for ease in machining and top interest-instruction. Literature on DEPENDABLE CASTINGS free to teachers. Students 20¢
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HANDICRAFT SUPPLIES
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Complete stock of lamp parts for your lamp projects shown in our catalog. Also contains charts and instructions for building and wiring lamps. These valuable instructions and catalog sent for 25¢.
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COVERWELL INKS FOR QUALITY PRINTING
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INDEX TO SHOP EQUIPMENT

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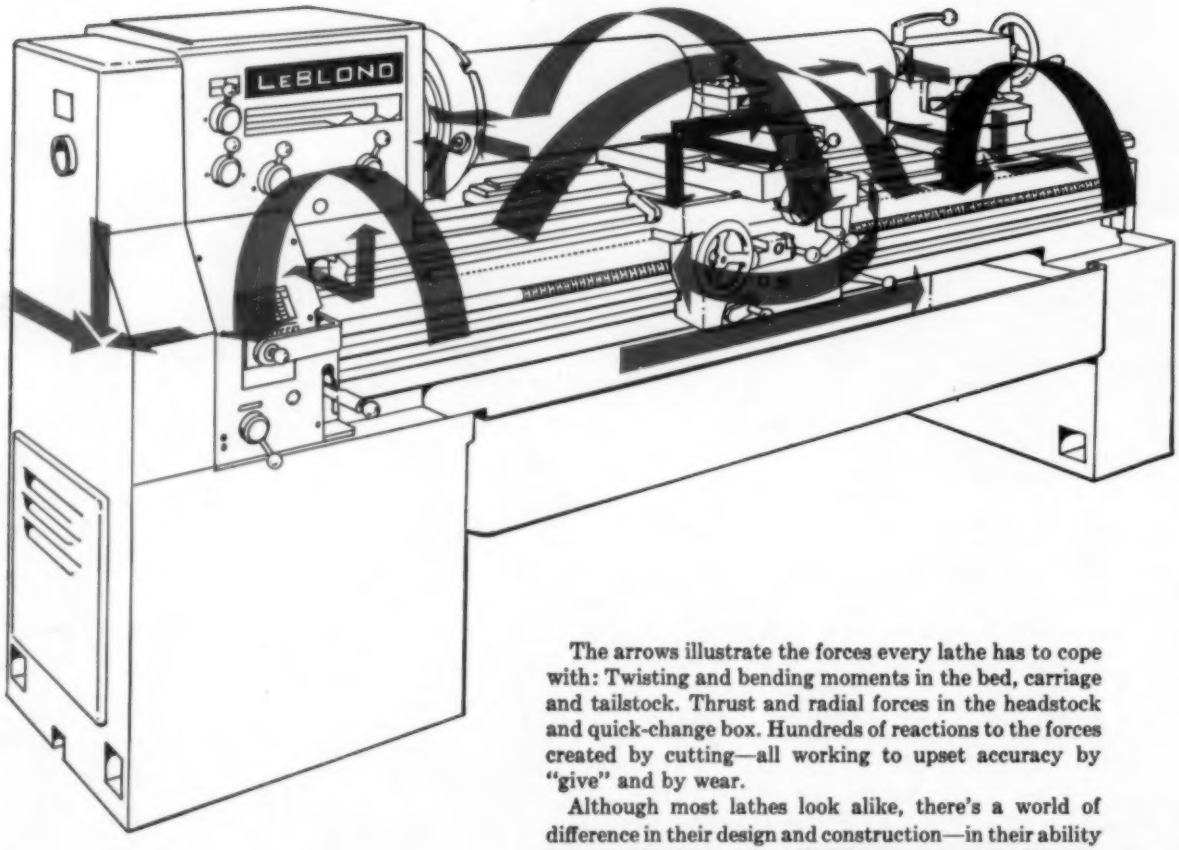

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